IMPLEMENTING THE

NATIONAL WATER PROGRAM STRATEGY: RESPONSE TO CLIMATE CHANGE

PROGRESS REPORT FOR 2008

Office of Water
U.S. Environmental Protection Agency
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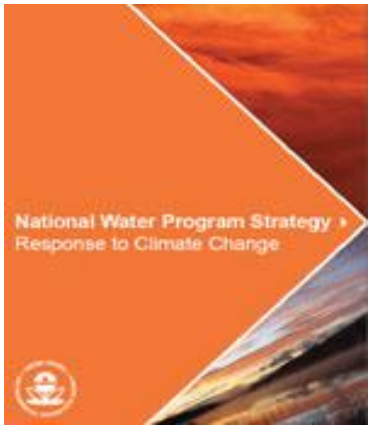
I) Introduction

In March of 2007, the Office of Water established a Climate Change Workgroup made up of senior water program managers from Headquarters and the EPA Regional Offices. This Workgroup assessed the implications of climate change for clean water and drinking water programs managed by the EPA Office of Water. After meeting with interested stakeholders, the Workgroup developed a ***National Water Program Strategy: Response to Climate Change***, which was published in September 2008.



Over the past year, the National Water Program has been both finalizing the *Strategy* and proceeding with implementation of many of the actions described in the *Strategy*. This report describes the progress made in implementing the *Strategy* during 2008.

The *Strategy* provides an overview of the major impacts of a changing climate on water resources and water programs, describes overall goals for the water program response to climate change, and identifies 44 specific actions for EPA to take to accomplish these goals during 2008 and 2009. One of the key actions (i.e. key action # 38) calls for an annual, public report on the work EPA is doing to implement the *Strategy.* This progress report has been developed in response to key action #38.

Report Organization

This document describes the implementation work that occurred in 2008 and is divided into three major sections:

- a description of activities by National Program Offices to implement the 44 key actions in the *Strategy;*
- a review of implementation of water-related climate change activities in EPA Regions; and
- a summary of EPA climate and water-related activities not specifically addressed in the *Strategy.*

The discussion of implementation of key actions is organized based on the five major goals of the *Strategy*:

Goal 1: Water Program Mitigation of Greenhouse Gases: Use core water programs to contribute to greenhouse gas mitigation

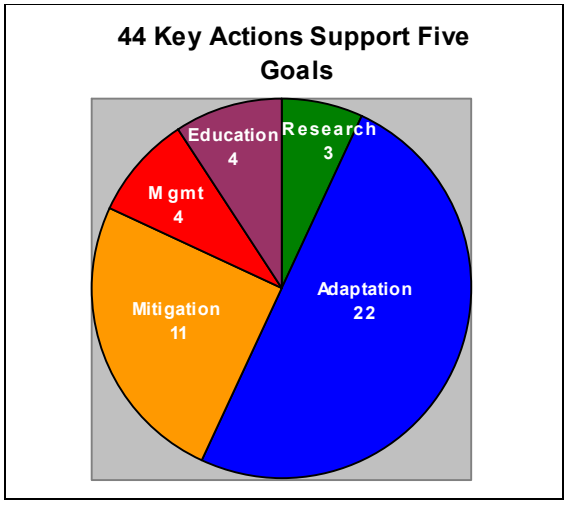
Goal 2: Water Program Adaptation to Climate Change: Adapt implementation of core water programs to maintain and improve program effectiveness in the context of a changing climate and assist States and communities in this effort.

Goal 3: Climate Change Research Related to Water: Strengthen the link between EPA water programs and climate change research.

Goal 4: Water Program Education on Climate Change: Educate water program professionals and stakeholders on climate change impacts on water resources and water programs.

Goal 5: Water Program Management of Climate Change: Establish the management capability within the National Water Program to engage climate change challenges on a sustained basis.

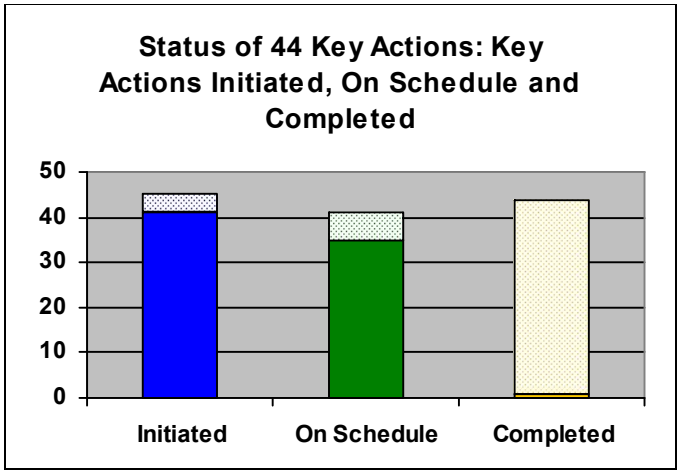
As indicated in the chart to the right, half of the 44 key actions involve tasks related to adapting water program implementation to a changing climate. Eleven key actions relate to opportunities to mitigate greenhouse gases through water program activities. The remaining actions relate to water-related research on climate change, education of water program managers on climate change issues, and integrating climate change within the management structure of the National Water Program.



Some of these key actions that support these five goals involve existing water program work that has climate change implications while other actions involve new activities, or changes in the direction of current activities, in response to climate change. Implementation of these new key actions was planned with an assumption of level funding and activities that could not be supported with available resources were deferred.

Finally, the narrative portion of this report is supplemented with appendices summarizing the implementation work, including the status of each key action with respect to implementation milestones and schedules and the work in EPA Regional offices related to climate change and water.

Summary of Progress



Overall, progress in implementation of the *Strategy* in 2008 has been substantial.

As indicated in the chart to the right, work on all but three of the 44 key actions has been initiated. For most of these actions, interim milestones and schedules have been accomplished and work is on schedule. Six of these actions are currently behind schedule. One of the key actions is now complete.

Some highlights of successful implementation efforts include:

- publication of proposed regulations designed to assure that geologic sequestration of carbon does not pose a threat to underground sources of drinking water;
- development of the "Climate Ready Estuaries Program;" and
- establishment of a Federal Interagency Workgroup on climate change and water matters.

Next Steps

EPA is committed to sustaining a strong effort to implement the *Strategy* and is actively engaged in adjustment of implementation plans in response to changing conditions and new scientific and programmatic information.

More information about the *Strategy*, including information on the development of the *Strategy* and its implementation is available on the Office of Water Climate Change Website at: www.epa.gov/water/climatechange. In addition, the Office of Water has established a Water Program/Climate Change Listserve. Anyone interested in receiving emails providing periodic updates on water and climate change topics, including implementation of the *Strategy*, is welcome to sign up for this Listserve.

II) Implementation of Climate Strategy by National Water Program Offices

The key actions identified in the *Strategy* support five major goals:

- Goal 1: Mitigation;
- Goal 2: Adaptation;
- Goal 3: Research;
- Goal 4: Education; and
- Goal 5: Management.

Each of the four national program offices within the Office of Water is responsible for implementing the key actions that support these five major goals. These offices include:

- the Office of Wastewater Management (OWM);
- the Office of Science and Technology (OST);
- the Office of Wetlands, Ocean, and Watersheds (OWOW); and
- the Office of Ground Water and Drinking Water (OGWDW).

The Office of the Assistant Administrator for Water (OWIO) is also responsible for implementing several of the key actions that cut across water program offices.

A status report on the work being done in each of these program offices to implement the key actions that support the five goals in the *Strategy* is provided below in section A through E.

A) Implementation of Goal 1: Water Program Mitigation of Greenhouse Gases

The largest sources of emissions and of potential reductions of greenhouse gases are from the electricity generation, transportation and industry sectors. However, reductions of greenhouse gases associated with water programs can play a role in America's efforts to reduce greenhouse gases.

Goal 1: Water Program Mitigation of Greenhouse Gases: use water programs to contribute to greenhouse gas mitigation.

Many of the actions that can help reduce greenhouse gas releases also help conserve scarce water supplies and help improve water quality. Water

conservation is a win-win-win situation–in many cases a single program investment will have greenhouse gas, water supply, and water quality benefits, and will lead to economic savings and greater sustainability of water infrastructure.

The key actions related to water programs that lead to mitigation of greenhouse gases are described in this section and fall into several categories:

- water-related energy conservation/production;
- water conservation;
- "green building" design and "smart growth;" and
- direct greenhouse gas emissions mitigation from agriculture.

If creation of greenhouse gases cannot be avoided, these gases can be "sequestered" so that they are not released to the atmosphere. Carbon dioxide sequestration refers to the process of removing carbon dioxide from the atmosphere and sequestering or capturing the carbon dioxide to prevent release to the atmosphere. Sequestration activities related to water programs include:

- geologic sequestration of carbon through underground injection; and
- "biological" carbon sequestration through forestry and agricultural practices, many of which benefit water resources.

Key actions in support of this goal are addressed below.

KEY ACTION #1: Improve Energy Efficiency at Water and Wastewater Utilities. The National Water Program will continue to work with the Office of Air and Radiation (OAR) to promote energy performance benchmarking programs, use of energy audits and energy tracking systems, use of alternative energy sources within plants (e.g., solar, wind, hydro), installation of Combined Heat and Power systems for heat and energy generation in facilities that use anaerobic digesters, and will provide State and local governments information on available and emerging treatment technology. **(Lead Office: OWM)**

Status:

In February, 2008, the Assistant Administrator for Water issued a memo to the EPA Regions on the nexus between water and energy (see: http://www.epa.gov/waterinfrastructure/pdfs/memo_si_bengrumbles_nexus-between-water-energy_02142008.pdf.) The memo is designed to elevate this important within the Regions and to solicit their involvement in promoting residential and commercial water efficiency, as well as energy efficiency at water and wastewater treatment plants.

OWM and OGWDW have also created a new web page addressing water and energy resources linked to the Better Management page (see http://www.epa.gov/waterinfrastructure/bettermanagement_energy.html

OWM developed, in cooperation with EPA Region 1, the ***Energy Management Guidebook for Wastewater and Water Utilities*** to help utilities address their key energy challenges through the Plan-Do-Check-Act approach embodied in environmental management systems (EMS). This ***Guidebook*** was released in January, 2008 and can be found on the internet at http://www.epa.gov/waterinfrastructure/pdfs/guidebook_si_energymanagement.pdf.

In addition, OWM has offered seven energy management training workshops across the country in 2008 and plans to conduct four additional workshops in 2009.

OWM is also collaborating with partners, including the EPA Office of Air and Radiation (OAR) and Water Environment Research Foundation (WERF) to pursue activities related to energy conservation and biogas use at publicly owned treatment works (POTWs) and the reduction or offsetting of greenhouse gas (GHG) emissions from POTWs, where possible. The goals are to significantly improve energy use efficiency, expand onsite methane to energy production, and reduce and offset GHG emissions.

In a key step toward stengthening cooperation with OAR was accomplished in November 2008 with the signing of a joint Memorandum of Understanding between OAR and OW (including both OWM and OGWDW) on energy efficiency at water facilities. This MOU is intended to provide a strong foundation for cooperation between the offices in this critical area and can be found on the internet at: on the internet at: www.epa.gov/water/climatechange/implementation.html.

OWM and OAR will continue to work on several of their programs including:

- *Energy Star Program* to promote energy performance benchmarking: 1) strengthen the energy bench marking tool to expand benchmarking capability to various plant process configurations and advanced treatment processes and incorporate biosolids management, handling and disposal options for wastewater facilities; and 2) help develop OAR's guide to improve energy efficiency and implement cost saving opportunities for the municipal wastewater industry.

- *Combined Heat and Power Partnership* to 1) promote the beneficial use of digester gas to produce power and heat for wastewater operations; and 2) promote ways to reduce greenhouse gas emissions for wastewater treatment and biosolids operations.

- *Development of fact sheets and case studies* for municipal wastewater treatment plant operators on energy conservation and alternative energy sources.

OWM is also working within OAR's schedule, and we anticipate that OAR will produce an Energy Star energy management guide for the wastewater industry and case studies and fact sheets within the next several years.

OWM is also planning, depending on resource availability, a study of successful POTW energy conservation projects. The document would be targeted to POTW decision makers to demonstrate the economic feasibility and greenhouse gas reduction benefits of implementing energy conservation projects that result in energy savings with reasonable payback periods. The study would summarize current available technical information and present performance, cost and savings data for a number of actual successful energy conservation projects.

OWM is also supporting the activities of our key stakeholders, such as the Water Environment Federation (WEF) and the Water Environment Research Foundation (WERF) to promote energy conservation and recovery at wastewater treatment plants including:

- *WERF's Issue Area Team (IAT)* to coordinate priority research needs in energy management, solids volume reduction, and resource recovery; and

- *WEF technical programs* at the 2008 Water Environment Federation Technical Exhibition and Conference (WEFTEC) on energy management and recovery.

KEY ACTION #2: **Implement the WaterSense Program.** EPA will continue its current efforts to implement the WaterSense program and will incorporate educational information about related reductions in energy use. **(Lead Office: OWM)**

Status:

Through increased water efficiency, significant energy efficiencies are gained thereby helping to decrease our nation's carbon footprint. EPA will continue its current efforts through the WaterSense program (http://www.epa.gov/owm/water-efficiency/) to inform the public about the energy required to supply, heat, and treat water and to coordinate the efforts of voluntary programs related to water and energy efficiency. WaterSense is saving 277 million gallons of water each year and results in saving Americans $1.6 million each year on water utility bills.

WaterSense program staff attended a Water-Energy meeting in Chicago in March 2008 and continue to collaborate with ENERGY STAR and the Alliance for Water Efficiency to make the water-energy connection on a regular basis. (Information about the Water-Energy meeting in Chicago is available at http://www.energystar.gov/index.cfm?c=partners.pt_meetings_water2008, the ENERGY STAR website is http://www.energystar.gov, and the Alliance for Water Efficiency website is http://www.allianceforwaterefficiency.org/.)

Also in March, 2008, WaterSense staff worked with the Office of Air and Radiation to finalize and publish *Water and Energy: Leveraging Voluntary Programs to Save Both Water and Energy,* a joint report illustrating the co-benefits of energy and water efficiency programs and summarizing the current and future opportunities to be pursued under the ENERGY STAR and WaterSense programs to save both energy and water (http://www.energystar.gov/ia/partners/publications/pubdocs/Final%20Report%20Mar%202008.pdf).

WaterSense completed a brochure for public distribution, "Saving Water, Saves Energy" and incorporated specific "Drops to Watts" messaging in all presentations to educate audiences on the connections between water and energy consumption (see: http://epa.gov/watersense/pubs/waterenergy.htm).

KEY ACTION #3: Water Conservation and Management for Drinking Water Systems. The National Water Program will explore opportunities with States and drinking water systems to better address expected impacts of climate change on water supply and water usage rates through water conservation and water resources management. **(Lead Office: OGWDW)**

Status:

OGWDW is providing support for states' efforts, described below, through the Association of State Drinking Water Administrators (ASDWA) to define water conservation and resource management issues and options related to source water availability, variability and sustainability.

In May 2007, OGWDW participated in two state listening sessions with ASDWA and the Ground Water Protection Council (GWPC) on water availability, variability and sustainability (WAVS) issues. Findings from the state listening sessions were presented and additional listening sessions were held at ASDWA and GWPC annual meetings.

ASDWA completed a national survey of state water management issues, practices and water conservation policies, programs and implementation mechanisms in Spring 2008. Survey findings will be summarized in a draft white

paper now undergoing State/EPA workgroup review and scheduled for release in the first half of 2009. The white paper will guide further work by ASDWA.

ASDWA's web site has begun highlighting WAVS issues at: http://www.asdwa.org/index.cfm?fuseaction=Page.viewPage&pageId=526&parentID=473&nodeID=1.

KEY ACTION #4: Water Conveyance Leak Detection and Remediation. The National Water Program will promote technologies to identify and address leakage from water pipes and other conveyances. **(Lead Office: OGWDW with OWM)**

Status:

EPA is collecting and compiling information on tools and techniques to conduct water audits and to identify and repair leaks in drinking water distribution systems. The information will be summarized in a document (hardcopy and web version) using decision tree and matrix formats to allow utilities to identify and implement effective water loss mitigation tools.

Key milestones in this work include:

- Develop and launch dedicated web page for water loss document, general water loss mitigation information, available research, links to state programs and utility organization resources; expected July 2009.
- Deliver a one-hour webinar (125 connections) to promote water loss mitigation and provide a synopsis of the information contained in the water loss mitigation document; expected October 2009.

KEY ACTION #5: Industrial Water Conservation, Reuse and Recycling Technology Transfer. The National Water Program will identify industries and facilities that best maximize their water efficiency and develop a technical guide for control authorities and industry for promoting water minimization, reuse, and recycling. **(Lead Office: OST/OWM)**

Status:

OW is funding the Water Science and Technology Board of the National Research Council of the National Academy of Sciences (NRC/NAS) to conduct study on "*Assessment of Water Reuse as an Approach for Meeting Future Water Supply Needs*." The study began this year and the report is expected by the end of 2010, at which time the results will be incorporated into case studies, fact sheets and technical guidance. (Information about the study is available at http://www8.nationalacademies.org/cp/projectview.aspx?key=48995.)

The study is assessing the current state-of-the-technology in wastewater treatment and production of reclaimed water; how available treatment technologies compare in terms of treatment performance, cost, energy use, and environmental impacts; challenges and limitations; infrastructure requirements of water reuse for various purposes; life cycle costs; benefits of water reclamation; and how reuse compares with other supply alternatives. More specifically, results of this study will be used to:

- update and revise its "2004 Guidelines for Water Reuse" (available at http://www.epa.gov/nrmrl/pubs/625r04108/625r04108.pdf);
- develop a comparison of performance, costs, energy requirements and greenhouse gas releases for different levels of wastewater treatment;
- develop a comparison of costs, energy requirements and greenhouse gas releases for water reclamation/reuse vs. desalination vs. long distance transport of water supplies and vs. pumping from deep aquifers, including case studies;
- update the comparison of wastewater treatment systems' performance, costs and energy use included in the 1993 report issued by the Water Science Technology Board on Managing Wastewater in Coastal Urban Areas (available at http://books.nap.edu/catalog.php?record_id=2049#toc); and
- develop case examples of the use of reclaimed municipal effluent as an alternative water supply by various types of industries.

KEY ACTION #6: Federal Agency Water Conservation Guidance.

The National Water Program will develop Water Efficiency Implementation Guidance for all Federal agencies under Executive Order 13423. **(Lead Office: OWM)**

Status:

Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy and Transportation Management* (January 29, 2007) directs each agency beginning in FY 2008 to reduce water consumption intensity, relative to the baseline of the agency's water consumption in FY 2007, through life-cycle cost-effective measures by **2% annually through the end of the fiscal year 2015 or 16 percent by the end of FY 2015**. For more information about the guidelines for meeting these goals, see the Water Efficiency Goals Guidance page. Federal sites should strive to meet or exceed this 2% annual savings in water use intensity each year. See also DOE guidance at: http://www1.eere.energy.gov/femp/pdfs/water_guidance.pdf

EO 13423 also directs Federal sites to conduct water audits of at least 10% of facility square footage annually and to conduct audits at least every 10 years. Federal agencies also are encouraged to purchase water efficient products and services, including WaterSense labeled products, and use contractors who are certified through a WaterSense labeled program, where applicable. More information can be found at the Environmental Protection Agency's WaterSense web site.

It should be noted that the requirements under EO 13423 supersede the requirements in EO 13123, namely the development of Water Management Plans and the implementation of FEMP Water Efficiency Best Management Practices (BMPs). However, agencies are encouraged to use these existing tools in achieving the goals of EO 13423.

OWM worked with Federal Water Guidance Working Group (WGWG) to update and revise the Water Efficiency Best Management Practices (BMPs) for Federal agencies. The new BMPs were posted on the FEMP website in February 2008; see http://www1.eere.energy.gov/femp/water/water_bmp.html. OWM also provided Questions & Answers for Federal building managers on the BMPs and posted WaterSense information.

WaterSense opened promotional partnership to federal agencies by welcoming the Centers for Disease Control and Prevention as a partner in June 2008. WaterSense continues to encourage federal agencies to become promotional partners.

KEY ACTION #7: Promote Energy Saving/Generating "Green Buildings" and "Green Infrastructure" Including Provisions Allowing Such Practices in Stormwater Permits. The National Water Program will work with other EPA offices to support States, Tribes, and local governments and the private sector in promoting the "green buildings" rating systems, with a focus on saving water and energy and will work to integrate "green infrastructure" practices into stormwater permits. **(Lead Office: OWOW with OWM)**

Status:

OWM will lead efforts to develop green infrastructure and National Pollutant Discharge Elimination System (NPDES) stormwater permits.

EPA formally released the Green Infrastructure (GI) Action Strategy on January 17, 2008, entitled *Managing Wet Weather with Green Infrastructure*. Included in its framework is a set of actions to address Clean Water Act (CWA) regulatory support.

Milestones include:

1. Memo clarifying that Green Infrastructure approaches are acceptable controls for combined sewer overflows (CSOs), stormwater etc. within the CWA.

On August 16, 2008, EPA issued the memorandum, "Use of Green Infrastructure in NPDES Permits and Enforcement" to EPA Regional Water Division Directors, EPA Regional Counsel/Enforcement Coordinators, and State NPDES Directors, committing to the development of specific guidance to assist implementation (see http://www.epa.gov/npdes/pubs/gi_memo_enforce.pdf).

2. Technical support to States for customized permit language for municipal separate storm sewer system (MS4) permits and fact sheets .

- West Virginia proposed an MS4 general permit incorporating Green Infrastructure this summer (2008). OWM participated in both a technical meeting with their MS4s and a general public meeting. The State re-proposed the general permit in January 2009.
  - Tennessee draft permit is undergoing internal review.
  - Oregon is taking comments on a proposed 'template' for their Phase I permits.
  - Pennsylvania has requested assistance on both MS4 and Construction permits; OWM has had one preliminary meeting so far.

3. Guidebook for State/Region permitting & enforcement programs on facilitating use of Green Infrastructure via regulatory programs.

EPA anticipates completing the Guidebook in Spring 2009. The Guidebook compiles various green infrastructure operation and maintenance protocols and examples for use in State/Region programs.

4. Guidance on interface between Green Infrastructure stormwater technologies and underground injection control (UIC) regulations for class V wells.

EPA issued the memorandum titled, "Clarification on which stormwater infiltration practices/technologies have the potential to be regulated as "Class V" wells by the Underground Injection Control Program" on June 13, 2008 to EPA Regional Water Division Directors: http://www.epa.gov/npdes/pubs/memo_gi_classvwells.pdf. EPA is incorporating a presentation of this information into its green infrastructure workshops.

5. Training for municipal officials who operate MS4s, CSOs, and other wet weather programs.

EPA has developed and conducted a significant of workshops in 2008 and has maintained webcast training available on the EPA website at: http://cfpub.epa.gov/npdes/outreach.cfm?program_id=0&otype=1 Many additional training tools are available from the EPA website at http://cfpub.epa.gov/npdes/home.cfm?program_id=298 , including research reports, case studies, models, and calculators.

For calendar year 2009: Region 3 has requested five workshops and there are two additional requests for Region 4, one request from Region 6 and from Region 7.

6. Pilot collaboration to develop 'green' long-term control plans (LTCPs) in select communities.

EPA is involved in number of negotiations with communities on incorporating solutions into LTCPs for combined sewer overflow (CSO) abatement. This has typically includes working closely via our regional offices, with state enforcement authorities, Department of Justice, and other relevant agencies, to come to mutual understanding and agreement about feasible technologies, enforcement order provisions and other issues. We expect several communities to finalize LTCPs in 2009 with notable green infrastructure components. Ongoing technical assistance to: Kansas City MO, Louisville KY, New York NY.

In addition, in 2007 EPA, released LTCP-EZ, a template for LTCP development for small communities. We have just initiated work on revisions to LTCP-EZ to include green infrastructure elements. We expect to have this available by fall 2009.

KEY ACTION #8: Develop Geologic Sequestration Regulations. In 2008, EPA will work with stakeholders to consider comments on regulations, proposed in July 2008, for siting and managing geologic sequestration (GS) projects to prevent endangerment of underground sources of drinking water. (Lead Office: OGWDW)

Status:

The Drinking Water Protection Division within the EPA Office of Water is developing regulations under the Safe Drinking Water Act's (SDWA's) Underground Injection Control (UIC) program.

Key milestones include:

- Conducted a two-day public stakeholder meeting in Washington DC to discuss the development of proposed regulations (completed December 2007);
- Hold a second two-day public meeting in Washington DC (completed February 2008);
- Published a proposed rule for public comment (completed July 2008);
- Held public hearings on the proposal in Chicago and Denver (completed September and October 2008);
- Extended the public comment period on the proposal to December 24, 2008.

The Agency will review and revise the rule based on comments and expects to publish the final rule in late 2010 or 2011. A key need is to build technical capacity in the states and direct implementation (DI) Regions.

KEY ACTION #9: Continue Technical Sequestration Workshops. The National Water Program will continue to coordinate with EPA's Office of Research and Development, the Department of Energy, and National Laboratories on geologic sequestration research and hold public meetings and workshops with experts and stakeholders.
(Lead Office: OGWDW)

Status:

The Office of Groundwater and Drinking Water completed its technical workshop series in January 2008 in New Orleans with a public workshop that addressed measurement, monitoring, and verification issues associated with carbon dioxide geologic sequestration. This key action is complete.

Coordination with EPA's Office of Research and Development, the Department of Energy, and National Laboratories will be ongoing throughout rule development.

KEY ACTION #10: Support Evaluation of Sub-seabed and Ocean Sequestration of CO_2. EPA will work with other interested agencies and the international community to develop guidance on sub-seabed carbon sequestration and will address any requests for carbon sequestration in the sub-seabed or "fertilization" of the ocean, including any permitting under the Marine Protection, Research, and Sanctuaries Act (MPRSA) or the Underground Injection Control program that may be required. **(Lead Office: OWOW)**

Status:

The Oceans and Coastal Protection Division will address any requests for permits under the MPRSA for carbon sequestration in the sub-seabed or for fertilization of the ocean for the purpose of sequestration. No requests are pending or expected at this time.

International guidance on sub-seabed carbon sequestration has been completed. Parties to the London Convention and London Protocol, under the chairmanship of the United States, completed guidance for sub-seabed carbon sequestration. The guidance, entitled "Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-seabed Geological Formations," was adopted by the 2nd meeting of Contracting Parties to the London Protocol in November 2007. The guidance will be posted on the International Maritime Organization's website. In the meantime, it can be found as Annex 4 to the report of the meeting at which it was adopted: http://www.imo.org/includes/blastDataOnly.asp/data_id%3D20797/17.pdf.

Extensive coordination is needed within EPA (especially with the UIC program and the Climate Change Program), as well as with interested Federal agencies (such as DOE, NOAA, and DOS), state agencies, international bodies (such as the London Convention/London Protocol Scientific Groups), and other stakeholders.

KEY ACTION #11: Pilot Marketing of Nonpoint Source Biological Sequestration. The National Water Program will support cooperative pilot projects with selected State section 319 nonpoint pollution control programs to demonstrate the potential for the cumulative results of 319 programs to provide carbon sequestration benefits. **(Lead Office: OWOW)**

Status:

OW is working with a contractor to define potential markets for water related biological sequestration actions, include both clean water and drinking water. This work will result in background papers for OW staff and other interested parties outlining options and issues for water programs.

The EPA Science Advisory Board is expected to release a draft of the integrated Nitrogen Strategy for the Agency in the near future which will comment on the science behind N-storage as well as carbon sequestration in the N-cycle.

The Conservation Technology Information Center recently hosted an international carbon sequestration symposium (see http://www.conservationinformation.org/?action=article&id=41). The proceedings will soon be published and will be of great assistance to watershed planners in developing 319 projects for carbon and nutrient storage.

EPA is participating in a DOI-led workgroup, called for in the new Energy Bill, to study Ecosystem Carbon Sequestration. OWOW is also following the research and information being compiled by the Consortium for Agricultural Soil Mitigation of Greenhouse Gases (see http://www.casmgs.colostate.edu/).

EPA will support cooperative pilot projects by providing appropriate assistance where states express interest.

II) Implementation of Goal 2: Water Program Adaptation to Climate Change

Goal 2: Water Program Adaptation to Climate Change: adapt implementation of core water programs to maintain and improve program effectiveness in the context of a changing climate.

As the climate changes, the National Water Program has an obligation to continue to ensure that water is safe to drink and that the health of aquatic ecosystems is protected. To meet this challenge, Federal, State and Tribal managers of clean water and drinking water programs will need to adapt the implementation of the programs in light of the changing climate.

Adaptation of water programs to climate change will be a long and iterative process. The understanding of the impacts of climate change on water that is now emerging from scientific studies, however, provides a sufficient basis for defining an initial set of preliminary steps to adapt water programs to climate change.

Key actions that National Water Program managers will take in response to climate change are discussed in the following five sections representing core water programs:

- Drinking Water, Water Quality and Effluent Standards;
- Watershed Protection;
- NPDES Permits;
- Water Infrastructure; and
- Wetlands Protection.

Key actions in support of this goal are addressed below.

KEY ACTION #12: **Address Impacts of Climate Change on Potential Contamination of Drinking Water Sources.** The National Water Program will evaluate, as part of the contaminant occurrence analyses supporting the EPA six year review of drinking water standards and the contaminant candidate list, the potential for projected climate change to increase the nature and extent of contaminants in drinking water supplies and systems. **(Lead Office: OGWDW)**

Status:

As the Six Year Review of regulated drinking water contaminants proceeds, OGWDW will evaluate currently available information for possible impacts of climate change on the occurrence of particular contaminants in water systems and identify what, if any, options may be prudent to address possible

changes in the nature and extent of contaminants in drinking water supplies and systems. The Agency expects to publish its preliminary results for the second Six Year Review in the Federal Register in late summer of 2009 and plans to request information from the public that may be useful in evaluating/considering the impact of climate change on contaminant occurrence in drinking water.

KEY ACTION #13: Assess Need for New or Revised Clean Water Microbial Criteria and Risks of Waterborne Disease. The National Water Program will assess the potential for increases in waterborne disease and other water-related disease vectors as a result of climate change, including recommendations for appropriate responses (e.g., publish new or revised biological/pathogen criteria for surface waters). **(Lead Office: OST)**

Status:

OST completed a literature review of re-growth of pathogens and pathogen indicators in tropical climates (December 2007) and is reviewing this information to determine relationships between pathogens and changing environmental parameters.

OST will also assess effects of changes in environmental parameters (e.g. temperature and rainfall) on recreational waters and will study tropical climates as a surrogate for waterbodies affected by climate change.

OST will conduct an epidemiological study to determine if the risks to human health when recreating in tropical waters are different from risks to human health when recreating in other recreation waters. The study is expected to be completed in December 2010.

KEY ACTION #14: Clean Water Criteria for Sedimentation/ Velocity. In anticipation of increased flow and velocity and sediment loadings in some streams, rivers, and estuaries, the National Water Program will review the potential for development of criteria for sediment and velocity in streams that are appropriate to these changing conditions. **(Lead Office: OST)**

Status:

OST is examining the policy and technical implications of velocity or flow standards. This has included discussions with water quality standards coordinators, and the Water Quality Standards Managers' Association (2007 and 2008).

Additionally, OST is providing technical and policy support to Regions and states interested in developing flow criteria, including helping Region 1 develop flow-based biological criteria (January 2008).

OST will compile information on current state and regional sedimentation/velocity initiatives/programs and will scope the issues and current tools available on sedimentation and velocity (2009). OST will also identify all flow/velocity standards nationally (2009).

KEY ACTION #15: Develop Biological Indicators and Methods. The National Water Program will improve the biological information base to better manage water resources in a changing climate, including developing guidance on coral reef bioassessments and biological criteria. **(Lead Office: OST)**

Status:

OST will conduct a scoping exercise to determine which states/regions have developed or are developing biological indicators of climate change. ORD conducted a workshop in February 2008 in which states reported on their biological baselines and biological indicators related to climate change; see http://www.epa.gov/ncea/workshop/. ORD is also planning to conduct four pilot studies on adaptation options with bioassessment programs with four states in different climatic regions of the country (Ohio, North Carolina, Utah and Maine). OST will work closely with ORD in this area.

OST, in cooperation with ORD, completed the Stony Coral Rapid Bioassessment protocol in July 2007. ORD is taking the lead in the development of the draft biocriteria technical guidance manual for stony corals for OST. It is expected to be completed in 2010.

OST is coordinating with ORD's National Center for Environmental Assessment (NCEA), which is leading the effort to assess state biocriteria programs and climate change. OST is also coordinating with ORD's National Health and Environmental Effects Research Laboratory (NHEERL) on the development of the stony coral biocriteria technical methods manual.

KEY ACTION #16: Link Ecological and Landscape Models. The National Water program will work with the Office of Research and Development and the Office of Air and Radiation and Federal partners to invest in refinement of models of ecological process and landscape hydrology. **(Lead Office: OST)**

Status:

OST is in the process of integrating the Surface Water Assessment Tool (SWAT) into BASINS and expects to complete this work by March, 2009. At the present time, SWAT does not provide the capability to readily address climate change scenarios in any of the other GIS platforms through which it is available. (Information about BASINS is available at http://www.epa.gov/waterscience/basins/.)

OST is also integrating the Climate Assessment Tool (CAT) into SWAT (Fall 2009). BASINS4.0 system will allow the public substantially greater access to the environmental impact forecasting capabilities that the CAT can provide when linked to this popular and widely used watershed model. (Information about CAT is available at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=198586.)

KEY ACTION #17: Evaluate New Industry Sectors. The National Water Program will evaluate new industry sectors (including biofuels) and existing effluent guidelines for industrial categories to determine potential NPDES permitting needs and assess the need for new or revised technology-based performance standards. **(Lead Office: OST)**

Status:

Alternate energy source development may result in effluent sources that need to be controlled. As part of its effluent guideline planning process, OST will review industrial sectors that have emerged or whose discharges have changed as a result of climate change issues.

The Water Permits Division and Engineering and Analysis Divisions within the EPA Office of Water also intend to evaluate whether effluent limitations guidelines might be appropriate for alternative energy sources such as biofuels. In addition, EPA intends to study whether these new industries associated with climate change, will require permits as new sources and/or new dischargers. Potential changes in effluent composition, such as changes in pollutants or the amount of pollutants due to new or different air emissions control technologies or the addition of carbon sequestration technologies, may also require modifications to existing industrial effluent guidelines or require changes in permit limitations for some existing industrial categories.

Key activities include:

1. **Evaluate existing effluent limitations guidelines (ELGs) to determine if they are applicable to emerging industry sectors such as biofuels.**

   As part of its annual 304(m) effluent guideline planning process, OST is evaluating new industrial sectors to determine if they may require further study or potential regulation. Climate impacts, including water conservation and reuse, are considered in the review. OW issued the most recent 304(m) plan in September 2008. The preliminary plan for 2010 is due in October 2009.

   Additionally, as part of the 2009 Clean Water Act Section 304(m) annual review, EPA is soliciting information on industrial sectors that use water

efficiency practices that promote water efficiency, re-use, or recycling. EPA is seeking this information to inform its evaluation of technology options across multiple industrial sectors. http://www.epa.gov/fedrgstr/EPA-WATER/2008/September/Day-15/w21484.htm

Water efficiency practices can reduce the amount of pollutants discharged by industrial facilities, especially for those facilities that have on-site wastewater treatment systems, but also for those without them. EPA's effluent guidelines rulemakings and reviews have documented numerous examples of industrial facilities employing water conservation as a means to meet effluent limitations based on promulgated effluent guidelines (see documents listed in Section 12.1 of EPA-HQ-OW-2004-0032-2783.1). Reducing water use will also reduce associated costs (and energy requirements) for industry.

On August 11, 2008, EPA's Office of Water, Water Permits Division and the Engineering and Analysis Division Directors issued the memorandum, "Applicability of Effluent Guidelines and Categorical Pretreatment Standards to Biodiesel Manufacturing" to EPA Regional Water Division Directors that summarizes existing ELGs and their relationship to the biodiesel industry: http://www.epa.gov/npdes/pubs/memo_biodieselpretreatment_aug08.pdf

2. **Conduct site visits of new industries as part of a process to characterize the discharges.**

   In 2007 and 2008, EPA staff visited approximately 30 biofuels facilities (ethanol manufacturing, biodiesel manufacturing, integrated facilities) throughout the Southeast, Midwest, and Southwest U.S. to gain a better understanding of the processes and their discharge characteristics. The results of the observations were developed into the memorandum issued in #1, above, and the Biodiesel and Ethanol Technical Guidances issued by EPA Region 7.

3. **Conduct a literature review to determine how industries will be impacted by climate change and to develop an understanding of emerging industries. For example, Canada has done work related to this that could provide useful insight about new industries sectors and their impacts.**

   OW is working with a contractor to evaluate how various facilities, permit parameters, and permit conditions may be affected by climate change. Additional information is being evaluated through the annual review conducted under Clean Water Act 304(m) effluent guideline planning process. (See discussion in #1 above.)

KEY ACTION #18: Watershed Climate Change Policy Memo. The Office of Wetlands, Oceans and Watersheds will develop a Climate Change Policy memo that promotes the incorporation of responses to climate change into these core programs. **(Lead Office: OWOW)**

Status:

Predicted changes in climate, particularly precipitation, stream flow, temperature and coastal inundation, could affect existing programs to protect and restore watersheds on a regional basis throughout the nation.

OWOW is examining the likely effects, uncertainty and possible responses to modify, if necessary, their existing program and policy structures. The results of those deliberations will be published in a discussion memo in 2009. Because of the uncertainty inherent in predicting changes to local watersheds and the flexibility of existing programs to respond to identified problems, program adjustments may be unnecessary.

KEY ACTION #19: Expand National Water Resource Surveys to Include Climate Change Indicators. The National Water Program will expand the national water resources surveys, such as the recent assessment of wadeable streams and the Coastal Condition Report, to address climate change issues and information. **(Lead Office: OWOW)**

Status:

The National Aquatic Resources Survey Team is exploring opportunities for the national aquatic resource surveys in evaluating the impact of climate change on our nation's rivers, streams, lakes, reservoirs, wetlands and coastal waters.

Key activities are:

- The Survey Team worked with other agency partners planning a half-day session for the Workshop on Climate Change Effects on Biological Indicators: Rivers, Streams and Lakes sponsored by NCEA on February 19-21, 2008.

- The Coastal Survey will evaluate existing data from NOAA and States on habitat destruction and sea level rise to include in the next Coastal Condition Report that will be released in 2011.

- A potential indicator under consideration for future fresh water surveys is an evaluation of changes in the extent of the target population. For example, the Western Environmental Monitoring and Assessment Program (EMAP) rivers and streams project included an indicator to

describe the size of the population of perennial waters versus intermittent and ephemeral waters. Changes in the size of the population reflect shorter term weather variability and longer term climate patterns. Over time, longer term patterns associated with climate change should become discernable in the data.

- The survey team, in partnership with OST, will look at changes in the condition of reference sites that are under minimal influence of localized, watershed scale land use change.

- In addition to looking at biological indicators, the survey team will explore potential indicators of stress that may be related to global climate change.

KEY ACTION #20: Assess Waterbody Spatial Changes Due to Climate Change. In cooperation with USGS, explore opportunities and needs to assess change in the spatial characteristics of fresh waters due to climate change and summarize any findings. **(Lead Office: OWIO)**

Status:

The Office of Water will work with USGS and other appropriate Federal agencies to identify key baselines describing the location of freshwater resources and identify waters for which boundaries may change in response to a warmer climate (e.g. changes in the size of the Great Lakes). As part of this work, OW will define appropriate steps to preserve baselines for long term future reference.

This key action is not yet initiated. Work planned for FY 2009 includes:

- initial meeting with USGS (Winter 2009);
- assessment of freshwater location baseline issues (Spring 2009); and
- summary of Findings (Summer 2009).

KEY ACTION #21: BASINS Climate Assessment Tool. The Office of Water will develop training sessions in Washington, DC and selected Regions to assist EPA, State, Tribal and other government staffs in using the CAT element of the BASINS decision support tool. **(Lead Office: OST)**

Status:

Due to other higher priorities, work on this project, including actual training sessions planned for 2009, is currently on hold.

KEY ACTION #22: "Climate Ready Estuaries". The National Water Program will establish a Climate Ready Estuaries Program in partnership with the Office of Air and Radiation's Climate Change Division. **(Lead Office: OWOW)**

Status:

OWOW/Oceans and Coastal Protection Division and OAR/Climate Change Division are jointly working with interested National Estuary Programs (NEPs) to develop and implement "Climate Ready Estuaries."

The Climate Ready Estuaries program works with the National Estuary Programs and other coastal managers to: 1) assess climate change vulnerabilities, 2) develop and implement adaptation strategies, 3) engage and educate stakeholders, and 4) share the lessons learned with other coastal managers.

The primary focus of the program is on adaptation of coasts to climate change as well as actions to reduce greenhouse gas emissions. The national program will designate NEPs and other coastal communities as "climate ready," allowing the coastal leaders to implement climate adaptation within their communities and market their needs and actions to public and private interests. The joint OW/OAR project has awarded 6 pilots and is proceeding, with additional support from ORD, to support those pilots as they complete vulnerability assessments and develop adaptation plans.

The six pilot estuaries are:

- Albemarle-Pamlico NEP;
- Charlotte Harbor NEP;
- Massachusetts Bays Program;
- New Hampshire Estuaries Project;
- Partnership for the Delaware Estuary; and
- San Francisco Estuary Project.

The project launched a web site on 2008 (http://www.epa.gov/cre) to disseminate the components of a coastal adaptation tool kit, which includes a new synthesis of coastal climate change adaptation options and sources for information of coastal climate impacts and elevation data and models.

Key activities in this work include:

1. Conduct a needs assessment with the NEPs to provide a foundation for design and planning of "Climate Ready Estuaries" (completed January 2008);

2. Prepare a summary of available adaptation techniques (completed February 2008).

3. Develop a prototype program design for examination and revision at the NEP National Meeting February 2008);

4. Implement the program in 6 pilot NEPs (completed Summer 2008); and

5. Expand to other NEPs and other coastal communities (projected for Summer 2009).

The program is co-lead by OWOW and OAR's Climate Change Division. ORD/NCEA/Global Change Research Program is also providing support to the work.

KEY ACTION #23: Continue Coral Reef Protections. The National Water Program will continue participation in the U.S. Coral Reef Task Force and support related efforts to protect coral reefs. **(Lead Office: OWOW)**

Status:

The National Water Program staff continue to participate in the U.S. Coral Reef Task Force. Recent activities related to the Task Force include:

- OW is one of three federal agencies invited to participate on the NOAA Coral Reef Conservation Program's (CRCP) Land Based Sources of Pollution Working Group, which is tasked with recommending goals and objectives for the CRCP to better address this major threat to coral reef ecosystems.

- the EPA Office of Research and Development, along with NOAA, are chairing a Climate Change Working Group formed by the Task Force as part of a Climate Change resolution passed in August 2007 and comprised of interested federal and jurisdictional Task Force members (see: www.coralreef.gov/climate/climate_samoa_2007.pdf.).

KEY ACTION #24: Review/Revise Nonpoint Pollution Management Measures: EPA will review the sector specific series "National Management Measures to Control Nonpoint Source Pollution" based on emerging information related to climate change impacts. **(Lead Office: OWOW)**

Status:

The primary focus of current activities is to evaluate the effectiveness of best management practices under predicted climate change impacts. In the

future, depending upon availability of information, OWOW will supplement the Nonpoint Source Management Measures technical documents with results of published research that indicates the change in effectiveness of particular management measures with respect to climate change.

KEY ACTION #25: Review and Adapt NPDES Permit Program Tools. Conduct an internal review of the flexibilities and tools in the NPDES program that can be used to respond to changing water quality/quantity conditions and new technologies; collaborate with programs within the Office of Water and across the Agency, modify and expand training to reflect climate change, and provide technical assistance to permit authorities and permit writers. **(Lead Office: OWM)**

Status:

The Water Permits Division will evaluate the NPDES permitting process to determine if sufficient flexibility exists within the program to adequately adapt NPDES permits to changes within the aquatic ecosystem as a result of climate change and to ensure they continue to be protective of water quality. Anticipated climate change impacts on the hydrologic regime include variations in water temperature, low flows, intensity of wet weather events, and ambient water quality. As an understanding of the impacts of these hydrologic changes emerges, the NPDES permitting process will need to assess the impacts and potentially adapt to accommodate them.

To do so requires that OWM evaluate the underlying data that permit writers and system engineers use when developing permit limits and design specifications. For example, NOAA maintains the precipitation frequency charts that are used by engineers to design systems. Those charts had not been updated since 1962, and NOAA has begun a process for revising them by updating them with precipitation data collected since then. However, NOAA currently is not planning to account for climate change for future precipitation. This raises a fundamental question as to how our constituents will use this data—as they design systems that may last 20, 50 or 100 years—and therefore maybe be under- (or over-) designing their systems.

Another example is permit writers' reliance on USGS stream flow data. However, EPA needs to evaluate the data and understand how permit writers and engineers use this data, to understand and articulate how to ensure that standard procedures account for climate adaptation strategies.

1. **Conduct a review of areas of the NPDES permitting program that may be impacted by climate change and the scope of that impact. Assess the flexibilities that exist within the NPDES framework and the data systems available for permit writers.**

OWM is working with a contractor to assess how climatic changes will impact the NPDES permitting process. Goals include assessing the tools used in writing permits, e.g., what information permit writers will need to write permits inclusive of climate change impacts, how to provide information to permit writers about climate change and the permitting process, as well as to identify areas where additional guidance may be necessary.

2. **Evaluate underlying data sources used by permit writers and develop information on how to use this data in NPDES permits considering a changing hydrologic regime. Review how these tools are being used and who is using them. Work with NOAA and USGS, and others as needed.**

   OWM, OST, and OGWDW collaborated with ORD to plan and convene an expert workshop in January, 2009. NOAA, USGS, ACOE, FEMA, DOE, and USDA were in attendance. Also, EPA has begun a dialogue with NOAA and we anticipate working with them to resolve some of these issues. In addition, the early discussions with USGS have laid the foundation for initiating further dialogue on these issues.

3. **Determine how to provide information to permit writers about climate change and the permitting process, as well as to identify areas where additional guidance may be necessary.**

   See #1, above. In addition, at a July 2008 NPDES Permit Writers Conference, Deputy Assistant Administrator Shapiro presented the National Water Program Climate Change Strategy to approximately 90 participants representing 26 States. Per recommendations from this meeting, OW is evaluating options which include the creation of an on-line forum to facilitate the exchange of information between permit writers.

4. **Collaborate across OW Offices to work on reviewing existing effluent guidelines including effluent limitations, ambient monitoring data, and effluent monitoring data.**

   See #1, above, and also Key Action #17.

5. **Evaluate the need for permit writers to consider climate change in developing permit conditions for cooling water intake structures or thermal discharges (CWA 316(a) and (b)). Revise existing guidance including 1977 Section 316(a) thermal discharge technical guidance to incorporate any applicable climate change considerations.**

   The 316(a) 1977 guidance review has begun and will continue through FY 2009.

KEY ACTION #26: Evaluate Opportunities to Address Wet Weather/Climate Impacts at Municipal and Industrial Operations. The National Water Program will evaluate the wet weather program to identify initiatives to effectively address increases in precipitation due to climate change. Actions will include identifying best practices for characterizing design storms that take climate change into account, incorporating climate change into outreach and training materials, and promoting Green Infrastructure and Sustainable Infrastructure. **(Lead Office: OWM)**

Status:

Water quality and wastewater facility managers will need to consider the changes in climate and hydrology that are expected to occur during the functional lifespan of their infrastructure, i.e., keeping such infrastructure "sustainable." A recent screening report by ORD indicated that there is concern that some communities in the New England and Great Lakes areas may exceed the 4-6 CSO annual target.

In order to make sound decisions, program managers first need good data and predictive tools to understand potential localized impacts on hydrology and water quality, as well as wastewater and stormwater conveyance systems and treatment systems. The heart of the issue lies in the scale mismatch between global climate models and local watershed or catchment models. Two approaches are likely needed until the resolution of data is refined—a "bottom up" and a "top down" approach. The bottom-up approach incorporates a vulnerability assessment for risk management, and is addressed in key action #29. The top down approach requires downscaling of climate data, and work to this end is addressed in key action #25.

OWM will participate in these efforts to ensure that wet weather program needs are addressed. An evaluation of the wet weather program will proceed as we develop more understanding of these localized impacts.

Key milestones include:

- participate in NOAA and USGS workgroups (continuing);
- develop white paper for the wet weather program (expected 2009); and
- conduct outreach to stakeholders to help them plan for climate change (ongoing).

KEY ACTION #27: Assess Climate Impacts at Animal Feeding Operations.

The National Water Program will work with USDA to evaluate climate change impacts, such as increases in wet weather, at animal feeding operations. **(Lead Office: OWM)**

Status:

Just as crop agriculture will be affected by a changing climate, so will animal agriculture. Increased storm and precipitation has implications for the storage capacity of lagoons and other waste storage structures, and poses the possibility for increased runoff from outdoor litter storage and from land application of manure. Increased dry periods will lead to increased evaporation rates, thereby possibly affecting ammonia volatilization rates from land application of manure/litter/wastes.

In addition, AFOs and CAFOs are a major source of methane, a powerful greenhouse gas that contributes to climate change. The Office of Air and Radiation has a "Methane to Markets" Partnership (http://www.epa.gov/methanetomarkets/) that develops methods for capturing methane from different waste streams, such as landfills and animal agriculture, for re-use as a clean energy source. The AgStar partnership (http://www.epa.gov/agstar/) with USDA encourages the use of methane recovery (biogas) technologies at the confined animal feeding operations that manage manure as liquids or slurries.

EPA's ORD and USDA's Agricultural Research Service are conducting studies on the feasibility of producing power from manure and litter and other agricultural by-products as well as studies on manure application that reduces ammonia volatilization rates. OW will keep abreast of progress on these studies and assist them in determining areas of focus.

Animal feedlot owners and operators will need information that enables them to account for the localized impacts of climate change in order to evaluate how to adapt. Therefore, results of key action #26 working with NOAA and the research community to 'downscale' data will be needed to make this work most effective.

1. **Engage USDA in dialogue to understand what they are doing to address climate change impacts; work with USDA such as to understand how Environmental Quality Incentives Program (EQIP) funds can be used to address water quality impacts of animal agriculture that may be exacerbated by climate change.**

   USDA participated in the January Expert Workshop; however, discussion on impacts of climate on animal feedlots has not begun.

2. **Assess the EPA CAFO program to identify impacts of climate change on AFOs and implications for the NPDES program.**

   The results of items 1 and 2 depend upon the outcome of Key Action #25 -- working with NOAA and the research community on understanding local impacts .

3. **Raise awareness in stakeholder community for need to incorporate a predictive capacity for climate change in models such as USDA's Manure Management Planner and the USDA's Soil-Plant-Air-Water (SPAW) Regional Water Impacts Model (available at http://wmc.ar.nrcs.usda.gov/technical/WQ/mmp.html and at http://www.bsyse.wsu.edu/saxton/spaw/); facilitate updates to models once data becomes available.**

   This work is not scheduled to begin until 2010.

KEY ACTION #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools to Include Climate Change. The National Water Program will continue the implementation of the Sustainable Infrastructure (SI) Initiative and incorporate climate change into its activities, including incorporating climate change considerations in a range of new and existing sustainable infrastructure tools and outreach efforts. **(Lead Office: OWM)**

Status:

The Sustainable Infrastructure (SI) Initiative is designed to help move utilities to sustainable practices which, in and of themselves, will help them to adapt to climate change. However, adapting to climate change will put an additional strain on our aging infrastructure and adds additional factors for water and wastewater managers to consider. The additional challenge posed by climate change will be integrated into SI work as opportunities arise.

Some examples of how SI tools are already addressing climate change can be found in the Energy Management Guidebook and workshops (discussed under key action #1) and work on leak detection (discussed under key action #4).

For other related milestones, see:

- Key Action #2 Implement the WaterSense Program;
- Key Action #6 Federal Agency Water Conservation Guidance;
- Key Action #7 Promote Green Buildings and Green Infrastructure;
- Key Action #26 Evaluate Climate impacts on the Wet Weather Program;
- Key Action #29 Sustainability Handbook and Climate Vulnerability Analysis; and

- Key Action #31 Clarify Use of SRFs for Climate related projects for related milestones.

KEY ACTION #29: Develop a Sustainability/Vulnerability Analysis Handbook for Climate Change Impacts. Work to publish a document describing a process through which utilities can conduct a self analysis of sustainability, including a climate change-specific vulnerability analysis. **(Lead Office: OWM)**

Status:

1. **Sustainability Handbook:** OW is reviewing the conclusions of a national meeting of water infrastructure experts to define next steps in this area and the best way to provide key information to water utility managers.

2. **Effective Utility Management:** Work on effective utility management is conducted by EPA in partnership with leading associations and utilities under the Statement of Support on Effective Utility Management signed in May 2007 (http://www.epa.gov/waterinfrastructure/watereum.html). Under this Agreement, OWM is working with these associations and leading utility managers to develop a series of tools, the first of which is a basic implementation guide based on the *Ten Attributes of Effectively Managed Utilities,* along with performance measures.

   The Agency has released the 'primer' (http://www.epa.gov/waterinfrastructure/pdfs/tools_si_watereum_primerforeffectiveutilities.pdf) to help utilities get started in assessing their operations based on the attributes and a series of suggested utility performance measures based on the attributes to gauge progress over time, along with an electronic resource "toolbox" linked to the *Ten Attributes;* link to toolbox is http://watereum.org/)

   The Agency is currently initiating work on a set of case studies to capture "lessons learned" as utilities begin to adopt and implement the ten attributes. Thereafter, further products and/or activities specific to the Effective Utility Management initiative, including those that may address climate change and other critical issues will be identified.

3. **Vulnerability Analysis:** EPA can perform a function as convener, clearinghouse and advocate to promote practices by water and wastewater infrastructure managers to evaluate their systems' vulnerabilities and to plan to improve the resiliency of their systems to adapt to climate change. This work will be an essential part of the Sustainable Infrastructure Initiative's work to promote sustainable management.

   During FY2008, EPA conducted a web search and networked with industry partners to identify current state of the art practices. A work assignment is in

place for development of the Vulnerability Assessment technical guidance and a product is planned for 2009. The January Climate Expert Workshop will lay the foundation for this document, and further work will be conducted thereafter. EPA's goal is to develop a best practice statement promoting climate change vulnerability assessments in 2009.

KEY ACTION #30: Clarify Use of the Clean Water and Drinking Water SRFs to Support Adaptation to Climate Change: Work with State partners to clarify what types of climate change-related infrastructure expenditures are eligible for State Revolving Fund (SRF) assistance. **(Lead Office: OWM and OGWDW, Co-Leads)**

Status:

- **Clean Water State Revolving Loan Fund (CWSRF):** OWM has worked with partners to determine what types of climate change related projects are eligible for CWSRF financial assistance. Eligibility was analyzed from both the perspective of reacting to conditions caused by climate change and reducing the emission of greenhouse gases (GHG).

  OWM issued a draft White Paper, titled, "Tapping the Untapped Potential of the CWSRF," to clarify the uses of the CWSRF, explore innovative finance techniques to augment assistance and efficiently deliver funding, and to refine strategic management of the program. The program has conducted substantive outreach activities related to the White Paper including a panel discussion during the 2007 annual Council for Infrastructure Financing Authorities (CIFA) Conference, a full day Headquarters Roundtable involving managers and staff of water, solid waste, and air programs, a webcast presented jointly with Iowa DNR on the vast potential of the CWSRF, and a series of State and Regional Roundtable Seminars attended by regional managers and state representatives. These roundtables have been conducted in Regions 6, 7, 8, and 9. The remaining regions will be visited in 2009.

  In addition to this general clarification of CWSRF eligibilities, OWM is developing a fact sheet titled, *Reducing Climate Change Effects with Clean Water State Revolving Funds*. The fact sheet presents how CWSRF funds are being used to reduce greenhouse gases and protect water in a changing climate. OWM plans to finalize the fact sheet in 2009.

  The 2008 CIFA Conference featured a session on climate change. OWM is currently planning an environmental track for the national CWSRF Conference, scheduled for July 2009, that will feature climate change issues and funding.

- **Drinking Water State Revolving Loan Fund:** OGWDW is working with Regions, States, and other stakeholders to clarify the broad range of climate change related projects and activities that can be supported by the Drinking Water State Revolving Fund (DWSRF) Program. A range of potential utility and State responses to climate change may be supported through the DWSRF fund itself or through State Set-Asides. Examples include:

  - Certain infrastructure investments in response to climate change;
  - Incorporation of climate change impact mitigation/prevention in short- and long-term DWSRF program planning and implementation;
  - Drinking water source assessment and planning activities that address projected climate change impacts under State capacity development strategies;
  - Assistance to water utilities in planning for and adapting to the effects of climate change on their infrastructure and other water resources;
  - Energy efficiency assessments and improvements (including operations monitoring and water pumping) in public water systems (PWSs); and
  - Leak detection and remediation.

  OGWDW is developing a Fact Sheet on use of the DWSRF for projects related to climate change and expects to release the fact sheet and to update the DWSRF document CD in October 2009.

KEY ACTION #31: Develop and Expand Emergency Response Planning.

The National Water Program will implement a range of actions to ensure existing emergency response planning considers impacts from climate change, and will work with federal partners to promote adoption of sustainable practices during recovery and rebuilding. **(Lead Office: OGWDW)**

Status:

Existing programs will serve as the basis for fulfilling the goal of providing utilities with tools, training, and resources they need to respond to potentially more catastrophic storms and droughts. As outlined in the Water Sector Specific Plan, as part of the National Infrastructure Protection Plan, a number of activities can be conducted to make the water sector more resilient when facing the impacts of an emergency.

EPA set a goal of providing 20 trainings to the water section of the Incident Command System and National Incident Management System by September 2008 and met this goal.

Throughout 2009, EPA will work with a range of stakeholders in this effort including:

- Office of Solid Waste and Emergency Response;
- Office of Water, Office of Ground Water and Drinking Water;
- Office of Water, Office of Wetlands, Oceans, and Watersheds;
- Federal Emergency Management Agency;
- United States Army Corps of Engineers;
- Water Sector Coordinating Council;
- Water Sector Government Coordinating Council;
- State drinking water and wastewater regulatory agencies;
- drinking water and wastewater utilities;
- Water and Wastewater Response Networks (WARN); and
- EPA's Response Support Corps.

KEY ACTION #32: **Evaluate Opportunities to Refine Implementation of the 404 Regulatory Framework to Address Climate Change.** The National Water Program will work with the Army Corps of Engineers to ensure the effective implementation of the regulatory framework under section 404 of the Clean Water Act in a way that considers the effects of climate change and will explore the need for additional guidance on avoiding or minimizing impacts, defining "significant degradation" and "unacceptable adverse impact", and/or implementing compensatory mitigation. **(Lead Office: OWOW)**

Status:

The Wetlands Division has been internally reviewing the 404 regulatory framework to identify strategic areas in which mitigating for or adapting to the impacts of climate change could potentially be addressed. Current and completed efforts include:

- Initiated internal discussion to identify areas of the program that could be revised to incorporate climate change impacts (completed March 2008).

- Initial review of the 50 nationwide general permits issued by Army Corps of Engineers. This includes a general analysis of the types of impacts resulting from climate change that may be considered in permitting decisions, as well as identification of general permits that are likely to be particularly affected by climate change impacts.

- Include Mitigation Rule provision supporting mitigation projects that provide the resilience needed to address climate change, such as coastal restoration projects designed to take into account reasonably foreseeable rises in sea level. (completed March 2008)

- Coordination with external stakeholders including the Association of State Wetland Managers, and identifying points of collaboration for their September 2008 conference, which was focused on climate change.

In addition, Wetlands Division plans to initiate several future actions, in coordination with the Corps and other relevant stakeholders, to further climate change related goals:

- Assessment of best management practices for considering climate change in permitting-related activities (e.g. state-federal coordination efforts of National Estuary Program).

- Analysis of environmental review activities that may be impacted by climate change; i.e., 404(b)(1) guidelines and review process for permits (e.g., 404(q) elevation and 404(c) veto processes). Discussions to strategize which activities might be revised according to programmatic needs and constraints.

- Consultation with regional wetlands officers and states to identify best management practices and shared goals for incorporating climate change concerns into permitting actions and state programs (e.g., state Climate Action Plans, Regional Plans).

KEY ACTION #33: **Finalize National Wetlands Mapping Standard.** Work with other Federal agencies to finalize the National Wetlands Mapping Standard and work with Federal partners to fund updates of arid west maps. **(Lead Office: OWOW)**

Status:

The Wetlands Division is working with the Federal Geospatial Data Committee (FGDC) to finalize the National Wetlands Mapping Standard. Comments have been received on the draft Standard from the Federal Register comment period and it is being revised to address comments.

The National Mapping Standard has been revised to reflect Federal Geographic Data Committee (FGDC) comments on the final Standard. The final Wetland Mapping Standard has been re-submitted to the FGDC standards workgroup for approval. The standards workgroup met December 11, 2008 and approved the Standard and it will now move to the full FGDC Steering committee for approval at their next meeting in 2009.

Prior to finalization of the National Wetlands Mapping Standard, the FGDC workgroup will begin working with partners, including Federal Agencies, States, Local governments and NGOs to pursue ways to fund/encourage statewide wetland mapping efforts. This work is ongoing and will continue over the next two years.

C) Implementation of Goal 3: Strengthen Climate Change Research Related to Water

Research on climate change issues related to water is occurring both internationally and in the United States. Much of this research is being managed by Federal agencies, including EPA.

Goal 3: Climate Change Research Related to Water: strengthen the link between EPA water programs and climate change research.

The National Water Program will benefit from much of the research now underway. At the same time, the National Water Program will begin to play a larger role in defining research priorities and working with the research community to make research results as useful as possible.

Key Actions supporting Goal 3 are:

- monitoring of Water related reports of the U.S. Climate Change Science Program (CCSP);
- climate Research in Water Related ORD Research; and
- revision of ORD Global Change Multi-Year Plan.

The status of each of these actions is described below.

KEY ACTION #34: **Monitoring of Water Related CCSP Reports.** The National Water Program will monitor the development of reports by the Climate Change Science Program and name a representative to join an ORD representative on the CCSP Water Cycle Working Group. ***(Lead Office: OST)***

Status:

The Office of Water named a representative to join the EPA Office of Research and Development (ORD) representative on the CCSP Water Cycle Working Group (November 2007).

The Office of Science and Technology within the Office of Water has monitored the development and review of CCSP reports and has forwarded reports to affected offices/programs within the Office of Water and EPA Regions. This is an ongoing activity until all Synthesis and Assessment Products (SAPs) are completed. Comments on draft reports have been provided to CCSP, via the EPA Office of Research and Development, the lead liaison office.

Throughout 2009, the Office of Science and Technology within the Office of Water will continue to monitor CCSP SAPs and provide materials to OW programs, collect comments, and forward comments to ORD.

The following SAPs are relevant to the Office of Water and have been monitored closely. Most of the SAPs are now final, except for 4.1 and 4.2.

SAP #	SAP Title
3.3	Weather and Climate Extremes in a Changing Climate: Focus on North America, Hawaii, Caribbean, and the U.S. Pacific Islands **(NOAA)** http://www.climatescience.gov/Library/sap/sap3-3/final-report/default.htm
4.1	Coastal Elevation and Sea Level Rise **(EPA)** http://www.climatescience.gov/Library/sap/sap4-1/default.php
4.2	Thresholds of Change in Ecosystems **(USGS)** http://www.climatescience.gov/Library/sap/sap4-2/default.php
4.3	Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity **(USDA)** http://www.climatescience.gov/Library/sap/sap4-3/final-report/default.htm
4.4	Review of Adaptation Options for Climate Sensitive Ecosystems and Resources **(EPA)** http://www.climatescience.gov/Library/sap/sap4-4/final-report/default.htm
4.5	Effects of Climate Change on Energy Production and Use **(DOE)** http://www.climatescience.gov/Library/sap/sap4-5/final-report/default.htm
4.6	Analyses of the Effects of Global Climate Change on Human Health and Welfare and Human Systems **(EPA)** http://www.climatescience.gov/Library/sap/sap4-6/final-report/default.htm
4.7	Impacts of Climate Change and Variability on Transportation and Infrastructure – Gulf Coast Study **(DOT)** http://www.climatescience.gov/Library/sap/sap4-7/final-report/default.htm

KEY ACTION #35: Climate Research in Water Related ORD Research. The National Water Program will work with the EPA Office of Research and Development in development of water research related to climate change and will also coordinate with external research foundations engaged in water and climate change related research.
(Lead Office: OST)

Status:

The Office of Science and Technology within the EPA Office of Water (OW) is coordinating climate research efforts for the Office of Water, working with other OW offices to identify climate related research needs, and develop an overall OW research request. OW and the EPA Office of Research and Development are working together to plan climate change research. In some cases, climate-related research needs may be included in the drinking water research multi-year plan (MYP), the ecosystem research multi-year plan and other appropriate multiyear research plans. For example the following research activities may be covered by other multi-year research plans:

- potential impacts of carbon sequestration on ground water quality;
- potential climate change impacts on growth and migration of drinking water pathogens; and
- ecological impacts due to climate change-induced hydrology and temperature changes.

In 2009, OST will work closely with ORD and lead offices in ORD that are conducting research related to OW's climate change research needs.

KEY ACTION #36: Revision of ORD Global Change Multi-Year Plan. The Office of Water will appoint a representative to participate in the ORD revision of the Global Change Multi-Year Plan (MYP). **(Lead Office: OST)**

Status:

OW reviewed and commented on ORD's draft Global Change MYP (January 2008) and reviewed the final draft of the MYP in the fall of 2008. OST will represent OW on the Global Change MYP team and will monitor the development of climate research related to water programs.

In addition, OW will continue to provide reviews and input on the selection of climate-related STAR Grants. ORD's Science to Achieve Results or STAR program funds research grants and graduate fellowships in numerous environmental science and engineering disciplines through a competitive solicitation process and independent peer review. The program engages the nation's best scientists and engineers in targeted research that complements

EPA's own outstanding intramural research program and those of our partners in other federal agencies.

In addition, OW collaborated with ORD to plan and convene an "expert workshop" in early January, 2009 addressing issues climate change issues related to water infrastructure (i.e. drinking water, wastewater, and stormwater). EPA will draw on the information presented at the workshop as it considers next steps in this area.

D) Implementation of Goal 4: Educate Water Program Managers on Climate Change

Climate change science and policy is evolving rapidly and the current understanding of climate change impacts on water resources, and conclusions about needed response actions, may change over time.

Goal 4: Water Program Education on Climate Change: educate water program professionals and stakeholders on climate change impacts on water resources and programs.

In order for the National Water Program to stay current with climate change issues, new practices are needed to strengthen outreach to partners and stakeholders on climate change-related water program issues and educate water program professionals on climate change generally. This communication needs to involve both EPA informing others about new issues and activities and EPA listening to and learning from the suggestions of others.

Key Actions supporting Goal 4:

- Clearinghouse/Website and Listserve;
- Annual Public Reports on Strategy Implementation;
- Outreach to Partners and Stakeholders; and
- Expand Existing Training Programs.

The status of each of these actions is described below.

KEY ACTION #37: Clearinghouse Website/Listserve. The Office of Water will work with other EPA offices to establish a website to provide documents related to water and climate change, including research products, and offer as part of this site, a "listserve" to send update emails to interested parties. **(Lead Office: OW)**

Status:

These two web tools—a climate change website/clearinghouse and Listserve—will provide basic information about the impacts of climate change on water programs including copies of related materials and links to the EPA climate change website and other related sites. The Listserve will provide periodic email updates on climate change-related issues to subscribers.

EPA established the expanded climate and water website in November 2008, about 3 months behind schedule. The Listserve was established in December 2008, about 2 months behind schedule. To review the website or sign up for the Listserve go to www.epa.gov/water/climatechange.

EPA expects to actively expand and update the website over the next year and plans to release information to the listserve mailing list on a about a weekly basis.

KEY ACTION #38: Annual Public Reports on Strategy Implementation. The Office of Water will publish annual reports describing progress in implementing the Strategy. **(Lead Office: OW)**

Status:

This report, and subsequent annual progress reports, are intended to identify progress toward key goals identified in the *Strategy*, describe "best practices" addressing the water impacts of climate change, and identify new or emerging issues.

This report constitutes the annual report of progress for 2008. Final publication of this report in January 2009 constitutes on schedule completion of this Key Action for 2008. EPA will publish a report on the status of implementation of Key Actions in 2009 in January of 2010.

KEY ACTION #39: Outreach to Partners. The Office of Water will provide material and briefings on the National Water Program climate change response actions periodically to a wide variety of EPA advisory groups, State and Tribal organizations, and stakeholder organizations. **(Lead Office: OW)**

Status:

The National Water Program is working with EPA Regional Offices, States, and other organizations to identify meetings, seminars, and other opportunities to provide information about climate change and to identify and address climate change issues related to water programs.

Since the publication of the Strategy in September 2008, EPA has held extensive meeting with State/Tribes, State/Tribal organizations, and others to review the Strategy and related topics. Extensive background materials have been developed to support this effort (e.g. powerpoint presentations, fact sheets, Q/A statements, and related materials).

Examples of these meetings include:

- presentation to National Tribal Water Council (October 15, 2008)
- presentation to ASIWPCA/ASDWA/ECOS (October 29, 2008);
- presentation to Office of Chief Financial Officer;
- presentation to American Water Works Association's Annual Conference and Exposition (June 2008);
- Region 1 presentation to New England Interstate Water Pollution Control Commission;
- Region 3 presentation to States;
- Maryland Groundwater Symposium (September 25, 2008)
- Region 6 presentation to States, Tribes, and environmental justice community; and
- Region 10 presentation to States.

KEY ACTION #40: Expand Water Training on Climate Change. EPA will revise existing training programs to include attention to the impacts of climate change on water programs and will offer training on water-related climate change impacts to national and Regional offices. **(Lead Office: OW)**

Status:

The National Water Program is including basic information about climate change in various training programs to help build understanding of climate change issues among water program staff and strengthen the ability of the program to address climate change problems. In addition, short, focused training

on climate change issues related to water would be a benefit to water program staff in national and Regional offices.

EPA has identified existing training programs that may benefit from a climate change module and is in the process of developing a pilot training module addressing climate change and water issues to be included in the Watershed Academy program. In addition, the permit writer's training, pretreatment training, Safe Drinking Water Act training, and green infrastructure training now include short references to climate change impacts and the *Strategy.* This work is on schedule.

This pilot climate change module will be included in other training programs in the future, including:

- the Water Quality Standards Academy;
- the Drinking Water Academy;
- Green Infrastructure Training;
- Stormwater Training and Webcasts; and
- the NPDES Permit Writers' Training Course.

E) Implementation of Goal 5: Establish Climate Change Management in Water Program

Goal 5: Water Program Management of Climate Change: establish the management capability within the National Water Program to address climate change challenges on a sustained basis.

Climate change poses significant and long-term challenges for the National Water Program. The development of the *National Water Program Strategy: Response to Climate Change* is a key first step in understanding climate change impacts on water programs and the beginning of the process of implementing response actions. To sustain this focus on climate change, the National Water Program will need to establish management practices to build on this initial assessment of climate change impacts.

Key actions supporting Goal 5 are:

- Maintain Office of Water Climate Change Workgroup;
- Include Climate Change in Strategic Plan and Annual Program Guidance;
- Support EPA Regional Additions to the *National Water Program Strategy*; and
- Establish a Federal Agency Water Climate Coordination Group.

KEY ACTION #41: Maintain Office of Water Climate Change Workgroup. The Office of Water will maintain the National Water Program Climate Change Workgroup. **(Lead Office: OW)**

Status:

An important step in the process of integrating climate change throughout the National Water Program is to continue the operation of the National Water Program Climate Change Workgroup. This group is chaired by the Deputy Assistant Administrator for Water and includes senior managers from national and EPA Regional offices as well as representatives of the Office of Air and Radiation and the Office of Research and Development.

Since the publication of the *Strategy* in September, the Workgroup has held 4 meetings and playing a key role in maintaining good communication among these offices on climate change issues and overseeing implementation of the Strategy. Workgroup members contributed much of the information provided in this progress report. During 2009, the workgroup is expected to play a role in making needed updates to the *Strategy.*

KEY ACTION #42: Agency *Strategic Plan* and Water Program Annual Guidance. The Office of Water will include key actions from the *Strategy* in the FY 2010 annual National Water Program guidance, and when appropriate, make needed changes to the water elements of the EPA *Strategic Plan.* **(Lead Office: OW)**

Status:

The National Water Program will integrate climate-related Key Actions with the established water program management tools, including the EPA *Strategic Plan* and the annual *National Water Program Guidance.* The initial materials for the revision of the EPA *Strategic Plan* in September of 2009 have been drafted and are included in preliminary EPA materials related to the Strategic Plan. This work is on schedule.

KEY ACTION #43: Regional Additions to National Water Climate Strategy. Each EPA Regional Water Division will review climate change impacts in the Region, identify impacts of special concern to that Region, and develop Region-specific additions to this national Strategy as needed. **(Lead Office: OW)**

Status:

Some Regional Water Divisions are considering supplementing the *Strategy* with key actions designed to more specifically address the needs in the Region. (See section III for more information on this Key Action.)

KEY ACTION #44: Federal Agency Water/Climate Coordination Group. The Office of Water will work with other Federal agencies with a significant interest in the water-related impacts of climate change through creation of a staff level coordination group. **(Lead Office: OW)**

Status:

In response to this Key Action, senior managers of five Federal agencies with substantial interests in climate change impacts on water resources recently signed a Memorandum of Understanding to establish an interagency workgroup to identify and address issues of common interest (see www.epa.gov/water/climatechange/docs/Agency_Senior_Staff_Fed_Agency_Coop_re_Adaption_of_Water-Related_Programs.pdf).

The five Federal agencies are:

- the Army Corps of Engineers;
- National Oceanic and Atmospheric Administration;
- U.S. Department of Energy;
- U.S. Department of Interior (Geologic Survey, Fish/Wildlife Service);
- U.S. Department of Agriculture.

This work was completed on schedule. The workgroup is meeting on a periodic basis to review issues of common interest and share information concerning policy or program developments. Issues of interest include mapping of sea level rise and development of Agency climate policy.

III) Climate Change and Water Activities in EPA Regions

EPA's ten Regional Offices play an important role in implementing the *National Water Program Strategy: Response to Climate Change*. Regional offices participated on the workgroup that developed the *Strategy* and will support the implementation of the *Strategy* in several important respects. In addition, EPA Regions are building on the Strategy to develop climate change and water related activities that respond to specific demands within each Region.

This section of the *2008 Progress Report* describes the activities that EPA Regions are undertaking to support implementation of the *Strategy* and to go beyond the *Strategy* to address specific needs in the Region. Each Region has undertaken the following implementation actions:

- allocated staff to support the National Water/Climate Workgroup;
- developed material for 2008 Water/Climate Change progress report;
- conducted are range of education and outreach activities; and
- supported specific key actions in national *Strategy*.

In addition, a range of additional actions are underway, or under consideration, in one or more Regions:

- development of a Regional supplement to national *Strategy;*
- development of a Regional Climate Change/ Water website; and
- development of an interagency process for coordination of climate and water issues.

Climate change and water activities in each EPA Region in 2008 are summarized below.

Region 1 (Boston):

Region 1 is focusing its climate and water work in two key areas: energy and water conservation at water facilities and development of climate ready estuaries.

For the energy and water conservation efforts, the Region has piloted the Energy Star portfolio benchmarking tool for sewage treatment plants and assisted over 50 facilities in this benchmarking work. The Region is also promoting the WaterSense program. All six States in the Region have become WaterSense partners and there are more than 80 partners involved, including irrigation companies and water trade associations.

Two of the six pilots for the Climate Ready Estuaries Program are in the Region (New Hampshire Estuaries and Massachusetts Bays) and a third estuary program (Casco Bay) is planning to apply for the program in the future. The Massachusetts Bay program is focusing on coastal vulnerability assessment and the New Hampshire program is focusing on road culverts and low impact development.

The Region is also working in several other areas including developing climate change indicators for the Gulf of Maine ecosystem, Green Buildings and Green Infrastructure, and coordination with various partners through regional alliances including the New England Governors' Conference, the Northeast Regional Ocean Council, the Gulf of Maine Council, and the New England Interstate Water Pollution Control Commission.

Region 1 is supporting the implementation of *Strategy* key actions # 1 (energy conservation at water facilities), #2-3 (WaterSense and water conservation), #7 ("Green Buildings and Green Infrastructure"), #22 (Climate Ready Estuaries), and #39 (outreach to partners).

The Region 1 climate change website is: www.epa.gov/region1/climatechange/index.html.

Region 2 (New York):

Region 2 is focusing climate and water work on protection of coral reefs and is supporting implementation of *Strategy* key action # 23. There are numerous programs involved in the protection and management of coral reefs. In order to bring all the pieces together, Region 2 established a Coral Reef Team (CRT) comprised of staff from various EPA regulatory, monitoring, and support programs. The CRT is focusing on the following goals/tasks:

- Assemble available information on coral reefs and all regulatory, monitoring, and scientific programs dealing with coral reefs;
- Establish and identify a process to organize/coordinate all regulatory, monitoring and scientific programs dealing with coral reefs (including coordination with other agencies at the Federal level (e.g. NOAA, USFWS, EPA-ORD, EPA-HQ) and at the local level);
- Make recommendations to EPA Region 2 senior management; and
- Addressing Climate Change issues.

The Region is also working on climate change and water in several other areas including the Water Sense Program, Green Buildings (Region 2 established a Green Team to coordinate green initiatives across the Region), Biological/Geological Sequestration, Sustainability, Public Outreach, the SRF Program and the Climate Ready Estuaries program through OCPD/CCD.

EPA Region 2 has also established a Climate Change/Energy Workgroup to coordinate and track energy and climate change activities throughout the Region. The Climate Change/Energy Workgroup will also identify opportunities to partner with key stakeholders to address energy priorities:

- Partner with Region 2 states (and NYC) to track and supplement their energy and greenhouse emissions programs;
- Partner with city governments to create energy and emissions plans; and
- Create multi-stakeholder partnerships with industry and NGOs to address environmental impacts of energy production in the coal and petroleum sectors.

Additional information on Region 2 Climate Change and Energy related activities can be found on the web at http://www.epa.gov/region02/climate/.

Region 3 (Philadelphia):

Region 3 has been focusing on a number of water and climate change projects.

The Region is actively involved in the Partnership for the Delaware Estuary (PDE) "Climate Ready Estuaries" pilot, which is one of six nationwide. On May 6th, a technical workshop and public “Town Square” meeting was held to discuss impacts and adaptation options for addressing climate change in the Delaware Estuary. Goals included developing consensus on the most pressing science and management needs, identifying a course of action, and engaging the public. A workgroup has been formed to support this effort and the next public forum will take place during the January 2009 Delaware Estuary Science and Environmental Summit.

The Region is also working with the Office of Air and Radiation's Climate Change Division and Region 2 on a project ($75,000), which will develop and implement a methodology for describing the ecological and economic impacts of sea level rise on selected ecosystem services in the Delaware Estuary. This ecosystem services project will provide significant information for PDE's ecosystem-based Regional Restoration Initiative currently under development and will also contribute valuable and timely information to the "Climate Ready Estuaries" pilot project.

The Region is also refocusing efforts on the impacts of climate change on infrastructure. An Electrical Efficiency workshop for wastewater & water operators is planned and the Region is participating in key marketing opportunities on energy efficiency at various broader events like Earth Day,

Coast Day, and the Philadelphia Flower Show to distribute thousands of WaterSense promotional materials. A "train-the-trainer" forum was conducted in May 2008 on Sustaining Water and Wastewater Infrastructure, offering expert advice, technical training, and hands-on learning related to infrastructure management software applications. Other topics discussed included asset management, Environmental Management Systems, and water conservation practices. The Region has also volunteered to serve as the first national Lead region for WaterSense and has increased focus and resources invested in Green Infrastructure through our Healthy Waters priority and Lands Team focusing on a number of projects designed to more effectively use water resources.

Another major area of focus for the Region is geologic sequestration. In addition to having two representatives on the Tier 2 Workgroup developing Underground Injection Control (UIC) regulations (Class VI), Region 3 is presently managing several experimental CO2 sequestration injection projects. One is for the injection of CO2 from a coal-fired power plant (AEP Mountaineer facility) and the other for CO2 injection into coal seams for the enhanced recovery of natural gas. The region is also directly overseeing a CO2 injection project in Virginia, where it has direct implementation authority for the UIC Program. This project involves the sequestration of CO2 into coal seams.

Region 3 is supporting the implementation of *Strategy* key actions #18 related to the watershed policy memo.

Region 4 (Atlanta):

Region 4 has focused climate and water work in three key areas: preparing the southeast for adaptations to climate change, greenhouse gas mitigation by supporting energy efficiency at Southeastern utilities, and demonstrating the potential for geologic sequestration of carbon dioxide.

Adaptation: Region 4 is working with the Office of Water and the Office of Air and Radiation to bring together a workshop of state and local practitioners and principals to assess and develop options for communities to use in adapting to the inevitable changes brought on by climate disruption. The workshop is scheduled for the fall of 2009 and will focus on synthesizing climate change impacts and scoping adaptation planning and management options for the U.S. Southeast. The planning and management lessons learned from the project will be available to be applied in other parts of the country.

In addition, Region 4 has two Climate Ready Estuaries (CRE) Pilot projects. The first CRE, a partnership with the Charlotte Harbor National Estuary Program (CHNEP), initiates preparation of an adaptation plan for Punta Gorda, a Southwest Florida coastal community. The second, partners with the Albemarle Pamlico Estuary Program in initiating a CRE project to promote outreach and education regarding understanding the effects of climate change on the North Carolina coast. Region 4 has additionally partnered with the CHNEP, utilizing

Regional discretionary funding, to undertake a climate change vulnerability assessment for the Southwest Florida coast. Each of these efforts is expected to provide information for and assistance to coastal Southeast US communities related to climate change vulnerability assessment and adaptation planning.

Mitigation: Region 4 and the Tennessee Department of Environmental Control (TDEC) co-sponsored an energy management workshop on October 14th, 2008 in Nashville, TN. The workshop was based on the Energy Management Guidebook for Wastewater and Water Utilities prepared by the Office of Water. Over ninety persons attended the well received workshop. The workshop focused on helping utilities develop energy management plans, prioritizing energy management activities, setting energy goals and reducing operating costs. Region 4 is planning similar workshops for other States in collaboration with the Tennessee Valley Authority and the Appalachian Regional Commission.

Sequestration: The Region is working closely with the Commonwealth of Kentucky by providing technical assistance and drafting of the Class V UIC permits for Duke Power and the Kentucky Geological Survey geologic sequestration for two pilot projects. Region 4 has UIC program implementation responsibility in the Commonwealth. The Region also provides grants and has oversight responsibility for the UIC programs in the States of Mississippi and Alabama which are in the process of issuing Class II and Class V UIC permits for two geologic sequestration pilot projects each in the Department of Energy's Southeast Regional Carbon Sequestration Partnership.

Region 4 is supporting the implementation of *Strategy* key actions #2 (Implement WaterSense Program), #7 (Promote Green Buildings), #11 (Pilot Projects for Marketing NPS Biological Sequestration), #17 (Evaluate New Industry Sectors), #22 (Climate Ready Estuaries), #28 (Continue Implementing Sustainable Infrastructure Initiative) and #32 (Evaluate Changes to 404 Needed to Address Climate Change).

Region 5 (Chicago):

Recognizing that energy management is a key to reducing climate impacts and enhancing infrastructure sustainability at water and wastewater facilities, Region 5 participated in three energy workshops in 2008. Workshops in Indiana and Wisconsin were developed through the EPA Office Wastewater Management to guide water and wastewater managers and operators toward a proven process to identify, measure, and reduce energy consumption at their facilities. Region 5 also used the two workshops as opportunities for outreach on energy conserving practices such as WaterSense and Combined Heat and Power. The third workshop was a POTW Nutrient Reduction and Energy Efficiency Workshop. Co-sponsored by Region 5 and State agencies and associations, this workshop was held in Kentucky and provided assistance to wastewater treatment plant

operators and consultants to improve energy efficiency while managing and controlling the discharge of nutrients.

Region 5 also recognizes that using green infrastructure approaches to address wet weather control objectives is a climate change mitigation strategy. The Region is working on voluntary approaches to accelerate use of green infrastructure practices, and is also seeking to set the stage for using regulatory and permit approaches to support green infrastructure approaches. In April 2008 Region 5 and Headquarters completed a policy paper on Green Infrastructure/ Low Impact Development and TMDLs. The Region is currently working on 3 pilot projects for waters impaired due to stormwater sources to develop TMDLs that will look explicitly at flows, hydrology, and the appropriateness of green infrastructure for restoring the impaired waters. In September 2008 the Region and Headquarters hosted a workshop on green infrastructure approaches for addressing CSO control needs. The Region is currently working with OWM and OECA on a Green Infrastructure Permitting and Enforcement Guide.

At the end of 2008, Region 5 released a comprehensive report on market factors that may restrain green infrastructure and green building practices. This report was the culmination of 16 months of work to investigate this topic. In the summer and fall of 2008 the Water Division and Great Lakes National Program Office, working in partnership with the Chicago Wilderness coalition, implemented a conservation and native landscaping awards program. This program recognizes sites that are exemplary in terms of green infrastructure, sustainable stormwater management, and use of native plants.

In addition, Region 5 is currently working with Chicago Wilderness on a climate change conference that will address habitat and biodiversity issues. Green infrastructure will be highlighted as a mitigation and adaptation strategy. The Region is also coordinating several projects to measure/quantify the performance of green infrastructure BMPs and to share research findings. This data is needed to help address lingering uncertainty about the performance of green infrastructure approaches for meeting wet weather control needs.

The Region is actively working with a major metropolitan sewer district to promote green infrastructure components in the negotiation of its CSO Long Term Control Plan (LTCP). Several other communities in Region 5 are being considered as candidates to include such measures in their LTCPs to be used in combination with conventional storage, conveyance, and treatment systems to meet infrastructure needs.

Region 5 was integral in the proposed rule-making process for Carbon Capture and Sequestration. In addition, the Region convened a workshop to discuss technical and regulatory issues relevant to underground carbon sequestration.

Region 5 is supporting the implementation of *Strategy* key actions #1 (energy conservation), #8, 9 (Carbon Sequestration), #7 (promote Green Buildings), and #26 (Evaluate Climate Impacts on Wet Weather Program).

Region 6 (Dallas):

Region 6 has been especially engaged in outreach to State partners. On August 5, 2008, the Region welcomed over 30 state officials and representatives from Texas, Oklahoma, Louisiana, New Mexico and Arkansas to the first regional dialogue on climate change. The first-of-its-kind forum is part of the Regional Clean Energy and Climate Change strategy that calls for expanding partnerships to tackle the factors that contribute to climate change. The forum's main goals were to familiarize participants with state and federal perspectives; better understand individual and mutual concerns; and identify follow-up needs.

As part of the forum, senior representatives from each state's environmental agency took part in the roundtable discussions, and shared their climate change strategies and suggestions with EPA leadership and other states. Attendees also heard technical presentations about current state initiatives and programs addressing greenhouse gas and cleaner energy solutions. In addition representatives from the British Consulate-General shared lessons learned from the United Kingdom's climate change policies. Over the next 16 months EPA will be working closely with participants to develop opportunities for regional cooperation.

In partnership with Region 8, Region 6 co-hosted a Regional Sustainable Water Infrastructure Forum in Denver December 2-3, 2008. Approximately 300 individuals attended this 2-day meeting where discussions centered around such topics as Integrating water policies and planning for a sustainable future, Water Utility Planning under Climate Variability, and 10 Attributes of Effectively Managed Utilities.

The Region has also played an active role in EPA's work to develop regulations for the protection of underground sources of drinking water in the case of geologic sequestration of carbon.

Region 6 is supporting the implementation of *Strategy* key actions # 8, relating to development of regulations for geologic sequestration of carbon, and #9, related to workshops addressing geologic sequestration.

Region 7 (Kansas City):

Region 7 is focusing on several areas related to water and climate change including energy conservation/production and water program adaptation to climate change.

Due to the number of ethanol and biodiesel production facilities in operation or under construction/consideration in Region 7, impacts to the environment including water and wastewater are important issues especially in the Region, especially in states with limited water resources. In FY 08, the Region 7 Biofuels Team completed the "Environmental Laws Applicable to Construction and Operation of Biodiesel Production Facilities" guidance which is a companion document to the previously completed guidance for ethanol production facilities. Both documents include information on water and energy conservation and wastewater treatment plant permitting.

The 2008 Iowa floods were considered the largest single disaster in the four state region of Iowa, Kansas, Missouri, and Nebraska. The Region 7 Water Emergency Planning and Preparation Team's previous work with water utilities in Iowa resulted in 95 of 96 drinking water systems impacted by floodwaters remaining in service as a result of advanced planning by the Team and state and utilities representatives. After action meetings have included significant discussion on water conservation and the WaterSense program. Public education on water conservation and the WaterSense program is accomplished through participation in meetings/events/trade shows throughout Region 7. Utilities in all four states, including the City of Kansas City, Missouri and the Missouri Department of Natural Resources are WaterSense partners.

In addition, the Region hosted and Energy Management Workshop with over 70 attendees and 100 webcast participants. Over 10 utilities requested follow-up support from EPA. The Region is working with state environmental and energy agencies and the Satellite Environmental Finance Center to develop pilot projects focused on energy management with these utilities. In addition, Region 7 has been actively involved with Kansas City, Missouri on green infrastructure solutions to be included in their Long Term Control Plan.

Region 7 is supporting the implementation of *Strategy* key action #8 related to development of the national regulation for geologic sequestration of carbon and worked with the Kansas Corporation Commission on development of state regulations.

Region 8 (Denver):

EPA Region 8 hosted the Sustainable Water Infrastructure Regional Forum in Denver on December 2-3, 2008 (http://www.epa.gov/region8/water/si_forum.html). Approximately 300 individuals attended this 2-day meeting where discussions centered around such topics as Integrating water policies and planning for a sustainable future, water utility planning under climate variability, and 10 attributes of effectively managed utilities.

Region 8 is leading by example by providing environmental educational tours of EPA Region 8's new gold LEED certified and ENERGY STAR® labeled building for over 8,200 people from a variety of community groups, developers, and individuals, including engineers, architects, city and county representatives, college and high school students. Water conservation features include:

- Water savings through the use of low-flow plumbing fixtures such as waterless urinals and dual-flush toilets.

- A vegetated green roof covers much of the building roof area. By incorporating vegetation, green roofs help reduce stormwater runoff, filter pollutants from stormwater, and contribute to overall sustainability by reducing building energy needs and minimizing urban heat island effects.

Region 8 is in the process of reviewing options for development of a supplement to the national Strategy addressing drought impacts of climate change with special attention to impacts on drinking water supply. Availability of quality water is of great concern to people in the Rocky Mountain West where much of the water is already allocated under State water rights regulation and where many groundwater supplies are over extended. Authorities for conservation, reuse and protection of existing supplies are shared by many organizations. Region 8 plans to support our partners in their response to the challenge of climate change through knowledge building, technical assistance, and partnerships.

Region 8's focus for this past year has revolved around Water and Energy Conservation (Key Actions #1-6), Green Building Design (#7) and Carbon Sequestration/Injection (#8 and 9).

The Regional climate change website is:
http://www.epa.gov/region8/climatechange/

Region 9 (San Francisco):

Region 9 is focusing on promoting sustainable infrastructure including water and energy efficiency at water and wastewater facilities. The Regional Water Program has created a Sustainable Infrastructure Office to develop tools to encourage activities that can mitigate and respond to the impacts of climate change. A new website addressing this work was recently established www.epa.gov/region09/waterinfrastructure.

The Region organized an Innovative Energy Management Workshop for water/wastewater facilities in December, 2008 in Sacramento (http://epa.gov/region09/water/npdes/energy-workshop/). A second conference with major utility sponsors is planned for southern California in 2009. The Region

is also actively promoting the WaterSense program and worked closely with the State of Hawaii to encourage energy and water efficiency project using SRF funds.

Other activities underway include support for the new Climate Ready Estuary program as part of the San Francisco Bay Estuary Project, support for a range of green infrastructure projects, support of the Region's climate change speaker series, and participation on California's Water/Energy Team to implement the State's climate change legislation (AB32).

Region 9 is supporting *Strategy* key actions # 1 (energy conservation at water facilities), 2 (water conservation), 22 (Climate Ready Estuaries), 23 (coral reef protection), 28 (sustainable infrastructure), and 30 (clarify use of SRFs).

Region 10 (Seattle):

Region has played an active role in bringing States in the Region together to evaluate climate and water issues. The Region organized a Climate Adaptation and Water Infrastructure Forum in September where stakeholders learned about climate change impacts in the northwest and Alaska, adaptation strategies and available tools and resources (http://yosemite.epa.gov/r10/ecocomm.nsf/climate+change/ccwi). A key focus of the conference was to support collaboration among many interested parties. Participants expressed great interest in identify tools that are available for evaluating water resource management issues, such as tools for "downscaling" climate change models to smaller scale planning decisions.

In a related effort, the Region worked with the Office of Wastewater Management (OWM) and Idaho Rural Water Association to sponsor an energy efficiency conference for water utilities, focusing on OWM's Energy Management Guidebook, OAR's new tool for benchmarking energy efficiency at utilities, and asset management for small utilities.

The Region is also working to develop ideas and models for the inclusion of climate change considerations, such as increasing the resiliency of watersheds. In the Skagit watershed, EPA has diverse resources (e.g. Office of Research and Development STAR Grants, Western Estuaries Initiative funding, and other funding that address climate change adaptation concerns. EPA is working with several other stakeholders to integrate their climate change efforts into a collaborative watershed approach Major stakeholders include Seattle City Light, two tribes, local watershed groups, local governments and others.

Region 10 is supporting the implementation of *Strategy* key actions #1 (energy conservation), # 4 (leak detection), and #18 (development of a watershed policy memo).

Region 10's regional webpage for climate and water is:
http://yosemite.epa.gov/r10/ecocomm.nsf/climate+change/ccwi

IV) Other Climate Change and Water Activities

In addition to implementing the *Strategy*, the National Water Program is working on a range of projects related to climate change that are not addressed in the *Strategy.* These activities have been developed in the latter part of 2008 and could not be included in the *Strategy* as it proceeded through the final review process. This work is described briefly below.

1. Cross Program Coordination of Climate Change Activities:

   The Office of Water is participating in several new efforts to strengthen coordination on climate change work across a range of EPA program areas. For example, EPA has initiated regular climate change coordination calls involving a wide range of program areas. The Office of Water also is participating in cross Agency efforts to evaluate methodologies and protocols for estimating the climate change benefits of voluntary carbon management programs and to develop consistent practices for estimating benefits.

2. Greenhouse Gas Reporting Rule:

   The Office of Water is participating in the Agency Workgroup developing the Greenhouse Gas Reporting Rule. A draft rule requiring that major sources releasing carbon dioxide and equivalent greenhouse gases report amounts of releases on a regular basis is expected to be released in the near future. The Office of Water supported evaluation of key sectors related to water including the wastewater treatment sector.

3. Water Quality Impacts of Biofuels Production:

   The Office of Water is working with the Office of Air and Radiation to review and assess the water quality implications of biofuels production. A key question being addressed is the impact of the production of agricultural feedstocks for biofuels on water quality, especially in the Midwest. A related question concerns the impacts of biofuels production facilities on surface waters and on groundwater supplies. EPA is considering a range of options for addressing and reducing water quality impacts. EPA Region 8 has worked actively in this area and developed guidance documents (see Region 8 summary; page 54).

4. Cooperation with State and Tribal Organizations:

   The Office of Water is working closely with State water organizations, including the Association of State Drinking Water Administrators (ASDWA) and the Association of State and Interstate Water Pollution Control

Administrators (ASIWPCA) to develop new agreements and processes for engaging these organizations in management climate related policy and program management. Several meetings with these groups have occurred to date and EPA plans to advance proposals to strengthen coordination in the Spring of 2009.

The American Indian Environmental Office (AIEO) continues to work with the Office of Air and Radiation and the Office of Research and Development on various aspects of climate change to assure Tribal interests are represented in climate change activities, as well as to assure appropriate information is provided to the Tribes. In developing the *National Water Program Strategy: Response to Climate Change*, AIEO worked with the National Tribal Water Council and Tribes in 2008 to assure Tribal review and input into the draft strategy. AIEO has sent notification of the final *Strategy* to all federally recognized Tribes and will work with the Tribes in its implementation.

5. Federal Agency Climate Change Coordination:

In addition to the work of the Federal agency workgroup on Climate Change and Water (see key action #44), the Office of Water is actively reviewing and commenting on major new climate change guidance and papers by other Federal agencies including:

- Proposed guidance from the Army Corps of Engineers addressing sea level rise and Corps projects;
- Climate Change Policy Papers from the Department of Interior (http://www.usgs.gov/global_change/doi_taskforce.asp#reports); and
- A draft paper by the US Geological Survey titled "*Climate Change and Water Resources Management: A Federal Perspective*".

The Office of Water is also participating in Federal agency coordination meetings on climate change policy hosted by the Office of Science and Technology Policy.

6. Ocean Acidification:

EPA has received a petition to review and revise the marine water quality criteria for pH based on emerging scientific information about the impacts on marine life of absorption of carbon dioxide by the oceans. Substantial new scientific information indicates that higher levels carbon dioxide in the atmosphere are absorbed by the oceans and that ocean waters are becoming more acidic. High levels of acidity pose a threat to the marine organisms with calcium structures such as corals. EPA is currently considering the petition and expects to respond to it early in 2009.

7. State Planning for Adaptation to Climate Change:

   The Office of Water is working with the Office of Air and Radiation and EPA Region 4 to support States in the southeast in evaluating options for planning for adaptation to climate change. EPA recently released a notice requesting proposals from organizations for work to develop background papers on adaptation challenges in the southeastern States and options for how these states might organize adaptation planning and management programs to be most effective. A workshop of senior State decision-makers in the southeastern States to consider these options is planned for the fall of 2009.

8. Climate Change Implications for the Future of Wastewater Treatment:

   The Office of Water is beginning to consider the implications of climate change for the design of the next generation of wastewater treatment facilities. Many existing facilities employ treatment processes that are energy intensive. Although the energy efficiency of these treatment processes can be improved, the significant reductions in energy use that may be needed to respond to a changing climate, and increasing energy costs, may require the development of alternative treatment processes and facility designs. A related consideration is whether there are options to use sewage as a source of energy or a feedstock for biofuels.

9. Sea Level Rise and Coastal Inundation Mapping:

   Building on a workshop on coastal climate adaptation planning held in September 2008, the Office of Water is co-chairing an initiative of the Coastal Coordinating Committee to coordinate all federal and state work on sea level rise mapping and inundation modeling in the context of climate change adaptation. Some coastal areas of the country now have very detailed topographic mapping that supports accurate simulations of inundation as a result of sea level rises and storm surges, but other areas lack this more accurate mapping data. A joint working group has been set up to craft a mission statement and identify specific tasks to accomplish in 2009-10. A related topic is how best to support State and local coastal planners in use of sea level rise mapping in making local land use and coastal ecosystem protection decisions.

10. Regional Effort Offers Funding for Natural Hazard, Climate Change Resilience Research

    The U.S. EPA's Gulf of Mexico Program, the Gulf of Mexico Sea Grant college programs, the NOAA Northern Gulf Institute, and the U.S. Geological Survey are inviting pre-proposals for projects dealing with natural hazard and climate change resilience. The goal of the initiative is to develop information, tools, technologies, products, policies or public

decision processes that coastal communities can use to increase resilience to coastal natural hazards and sea level rise.

Projects are to address research questions identified in the Gulf of Mexico Regional Research Plan and the Gulf of Mexico Alliance Action Plan II. Federal funds for each selected project will not exceed $200,000 per year for two years. Non-federal matching funds are required at 50 percent of the federal amount. Interdisciplinary projects are encouraged, and projects must be regional in scope. For more information: http://flseagrant.org/funding/GOM.

11. **Coordination with Federal Highway Administration**:

The Federal Highway Administration convened representatives from 11 Federal agencies in June of 2008 to discuss partnership opportunities to reduce greenhouse gas (GHG) emissions from transportation sources. The EPA Office of Water is participating on a newly formed Interagency Working Group. The long-term goals for the Working Group are to explore opportunities to leverage Federal resources, policies and programs to reduce VMT, and thus GHG emissions and congestion, and to develop an interagency action plan including legislative, regulatory, and policy recommendations. The Office of Water is working with this group to identify actions to support these goals. Most recently, draft action plan items have been developed and vetted.

12. **Assisting Coastal Land Trusts with Climate Change Adaptation**

The Office of Water is developing an MOU on "Coastal Conserving Networking" with the National Oceanic and Atmospheric Administration, Fish and Wildlife Service, Land Trust Alliance, Restore America's Estuaries, and The Nature Conservancy, to provide tools, training and an education platform for coastal land trusts. This platform will enable land trusts to take conservation action in coastal areas that is informed by each party's national and regional programs and priorities for coastal conservation, as an adaptive strategy in the face of climate change.

APPENDIX

PROGRESS REPORT
NATIONAL WATER PROGRAM STRATEGY: RESPONSE TO CLIMATE CHANGE

This table indicates the status of work to implement each key action in the *Strategy.*

Key Actions		Office of Water Lead with Supporting Offices	Status To be initiated – TBI/date Underway - U Completed - C	Progress On schedule ⇔ Ahead of schedule ⇧ Behind schedule ⇩
1) Greenhouse Gas Mitigation				
Energy Conservation/Production				
1	Improve Energy Efficiency at Water and Wastewater Utilities	OWM (Note that OAR leads this work for the Agency)	U	⇔
Water Conservation				
2	Implement Water Sense Program	OWM	U	⇔
3	Water Conservation at Drinking Water Facilities	OGWDW	U	⇔
4	Water Conveyance and Leak Detection Remedies	OGWDW with OWM	U	⇩
5	Industrial Water Conservation and Reuse	OST	U	⇔

Key Actions		Office of Water Lead with Supporting Offices	Status To be initiated – TBI/date Underway - U Completed - C	Progress On schedule ⇔ Ahead of schedule ⇧ Behind schedule ⇩
6	Federal Agency Water Conservation Guidance	OWM	U	⇔
Green Building Design and Smart Growth				
7	Promote Green Buildings	OWOW with OWM	U	⇔
Agriculture Related Mitigation				
Carbon Sequestration/Injection				
8	Develop Geologic Sequestration Regulations	OGWDW	U	⇔
9	Continue Technical Workshops	OGWDW	C	⇔
10	Evaluate Ocean and Subseabed Sequestration	OWOW	U	⇔
Biological Sequestration				
11	Pilot Projects for Marketing NPS Biological Sequestration	OWOW	U	⇔

Key Actions		Office of Water Lead with Supporting Offices	Status To be initiated – TBI/date Underway - U Completed - C	Progress On schedule ⇔ Ahead of schedule ⇧ Behind schedule ⇩
2) Water Program Adaptation to Climate Change				
Water Quality and Technology-Based Standards				
12	Address Impacts of Climate Change on Potential Contamination of Drinking Water Sources	OGWDW	U	⇔
13	Assess Clean Water Microbial Criteria and Risk of Waterborne Disease	OST	U	⇔
14	Consider Criteria for Sedimentation/Velocity	OST	U	⇔
15	Develop Biological Indicators and Methods	OST	U	⇔
16	Link Ecological and Landscape Models	OST	U	⇩
17	Evaluate New Industry Sectors	OST with OWM	U	⇔
Watershed Approach				
18	Watershed Climate Change Policy Memo	OWOW	U	⇔

Key Actions		Office of Water Lead with Supporting Offices	Status To be initiated – TBI/date Underway - U Completed - C	Progress On schedule ⇔ Ahead of schedule ⇧ Behind schedule ⇩
19	Expand National Water Resource Surveys to Address Climate Change	OWOW	U	⇔
20	Assess Fresh Waterbody Spatial Changes Due to Climate Change	OW	TBI: Spring 2009	⇔
21	Promote BASINS Climate Assessment Tool	OST	TBI: 2009 (note; on hold)	⇩
22	Climate Ready Estuaries	OWOW	U	⇔
23	Continue Coral Reef Protections	OWOW	U	⇔
24	Review/Revise NPS Guidelines	OWOW	U	⇔
NPDES Program				
25	Review Permit Program Tools	OWM	U	⇔
26	Evaluate Climate Impacts on Wet Weather Program	OWM	U	⇔
27	Assess Climate Impacts at Animal Feeding Operation	OWM with OWOW	TBI: January 2009	⇔

Key Actions		Office of Water Lead with Supporting Offices	Status To be initiated – TBI/date Underway - U Completed - C	Progress On schedule ⇔ Ahead of schedule ⇧ Behind schedule ⇩
Water Infrastructure				
28	Continue Implementing Sustainable Infrastructure Initiative	OWM with OGWDW and OWOW	U	⇔
29	Sustainability Handbook with Climate Impacts	OWM with OGWDW	U	⇔
30	Clarify Use of SRFs for Climate Change Related Projects	OWM with OGWDW	U	⇔
31	Expand Emergency Response Planning	OGWDW with OWM	U	⇔
Wetlands Protection				
32	Evaluate Changes to 404 Needed to Address Climate Change	OWOW	U	⇩
33	Complete National Wetlands Mapping Standard	OWOW	U	⇔
3) Water/Climate Related Research				
34	Monitoring of Water Related CCSP Reports	OST	U	⇔

Key Actions		Office of Water Lead with Supporting Offices	Status To be initiated – TBI/date Underway - U Completed - C	Progress On schedule ⇔ Ahead of schedule ⇧ Behind schedule ⇩
35	Add Climate Research in ORD Water Related Research Plans	OST	U	⇔
36	OW Role in Revision of Global Climate Research Plan	OST	U	⇔
4) Education on Climate Change				
37	Clearinghouse/Website	OW	U	⇩
38	Annual Public Reports on Strategy Implementation	OW	U	⇔
39	Outreach to Partners and Stakeholders	OW	U	⇔
40	Expand Existing Training Programs	OW	U	⇩
5) Climate Change Management				
41	Maintain Office of Water Climate Change Workgroup	OW	U	⇔
42	Strategic Plan and Annual Program Guidance	OW	U	⇔

Key Actions		Office of Water Lead with Supporting Offices	Status To be initiated – TBI/date Underway - U Completed - C	Progress On schedule ⇔ Ahead of schedule ⇧ Behind schedule ⇩
43	Regional Additions to National Strategy	Regions with OW	U	⇔
44	Federal Agency Water Climate Coordination Group	OW	U	⇔

EPA OFFICES:

OAR	Office of Air and Radiation
OGWDW	Office of Groundwater and Drinking Water (EPA's Office of Water)
OST	Office of Science and Technology (EPA's Office of Water)
OW	Office of Water
OWM	Office of Wastewater Management (EPA's Office of Water)
OWOW	Office of Wetlands, Oceans, and Watersheds (EPA's Office of Water)